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Thesis

EVALUATING A UNIT ON BEHAVIOR IN TENTH-GRADE BIOLOGY

Submitted by

Alva Zer Allen

(A. B., Dartmouth, 1933)

In partial fulfillment of requirements for  
the degree of Master of Education

1942

First Reader: Roy O. Billett, Professor of Education  
Second Reader: J. Wendell Yeo, Assistant Professor of Education  
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Boston University  
School of Education

✓

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Aug 5, 1942  
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1. The first part of the paper is devoted to a general discussion of the problem of the existence of solutions of the system of equations (1) for arbitrary values of the parameters  $\alpha$  and  $\beta$ . It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous and has a bounded derivative. The second part of the paper is devoted to a detailed study of the properties of the solutions of the system (1) for arbitrary values of the parameters  $\alpha$  and  $\beta$ . It is shown that the solutions of the system (1) are unique and depend continuously on the parameters  $\alpha$  and  $\beta$ . The third part of the paper is devoted to a study of the asymptotic properties of the solutions of the system (1) for large values of the parameters  $\alpha$  and  $\beta$ . It is shown that the solutions of the system (1) approach zero as the parameters  $\alpha$  and  $\beta$  approach infinity.

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## CHAPTER I

### THE PROBLEM RELATED TO THE AIMS OF EDUCATION IN GENERAL, AND OF BIOLOGY TEACHING IN PARTICULAR

#### The Development of the Problem

Nature of the problem.-- The understanding of behavior is of fundamental interest to all people. We are told that the study of people and of how to influence them has been Hitler's main interest from early childhood. Salesmanship is based on an understanding of human nature, and in a broad sense we are salesmen not only on our jobs, but in winning a wife and in getting along with people.

Psychology teaches some practical information about behavior, but it is not taught in most high schools. Courses in salesmanship in high school are narrow in scope. Social studies courses are too general. Biology courses may give the physiological basis of behavior but not much else. There seems to be no high school subject presenting integrated, useful information on behavior. The problem has been to build such a unit and to use it as a part of a biology course.

Methods used in solving the problem.-- It has been necessary to decide upon the aims of a unit on behavior, how it shall be organized and taught, and to evaluate the results. The materials and methods finally selected have been examined for their validity in harmonizing with the aims of secondary education in general, and science instruction



in particular. The unit and unit assignment method of organization and teaching, as explained by Dr. Roy O. Billett of Boston University in his courses on "The Reorganization of Secondary School Curricula" and "The Unit Assignment," and in his recent book,<sup>1/</sup> has been used. Evaluation of the unit on behavior has been by means of objective tests, day-to-day records of class activities and achievement, and teacher observation of pupils in and out of class.

Selected Statements on the General Aims of Education  
and Methods of Attaining Them

The cardinal principles.-- The best known authoritative statement of the aims of secondary education in the United States<sup>2/</sup> lists seven: health, command of fundamental processes, worthy home membership, vocation, citizenship, worthy use of leisure, and ethical character. If these were really adopted as basic and put into practice, secondary schools would improve. The objective of health is neglected in many schools of the author's acquaintance. The emphasis is too often on money-making basketball teams, and a successful season seems to imply a successful program of health education! Efforts to educate the morals and emotions of young people, to develop balanced personalities along with balanced minds, are too often regarded in the community as meddling by over-zealous teachers.

<sup>1/</sup>Roy O. Billett, Fundamentals of Secondary-School Teaching, Houghton Mifflin Company, New York, 1940, pp. 87-182, 459-657.

<sup>2/</sup>Cardinal Principles of Secondary Education, Commission on the Reorganization of Secondary Education, Bulletin 1918, No. 35, Government Printing Office, Washington, D. C., 1918, pp. 11-16.



22 September 1964 (Friday) 10:00 AM. Arrived at  
the 1000 ft. station. The 1000 ft. station is a  
small, rectangular, concrete structure, 10 ft. long  
and 4 ft. wide. It is situated on a small, rocky  
island, about 100 ft. from the shore. The water  
is very shallow, and the bottom is composed of  
fine sand and small rocks. The water is very  
clear, and the sky is blue. The temperature  
is 75°F. The wind is light and variable.

1000 ft. Station. 10:00 AM. Arrived at  
the 1000 ft. station.

1. The 1000 ft. station is a small, rectangular,  
concrete structure, 10 ft. long and 4 ft. wide.  
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concrete structure, 10 ft. long and 4 ft. wide.  
It is situated on a small, rocky island, about  
100 ft. from the shore. The water is very  
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clear, and the sky is blue. The temperature  
is 75°F. The wind is light and variable.

10:00 AM. Arrived at the 1000 ft. station.

10:00 AM. Arrived at the 1000 ft. station.

10:00 AM. Arrived at the 1000 ft. station.



Koos' statement.-- Nine years after the seven cardinal principles were published, Koos <sup>1/</sup> made a careful restatement of the general aims of secondary education. He recognizes four major aims: civic-social-moral responsibility, recreational and aesthetic participation and appreciation, occupational efficiency, and physical efficiency. These, with six functions of the secondary school which will be discussed later, constitute an enriched reinterpretation of the cardinal principles.

Other statements.-- Stoddard <sup>2/</sup> states four objectives of education: self-realization, human relationship, economic efficiency, and civic responsibility. This represents another attempt to modernize and improve upon the original seven principles.

<sup>3/</sup> Thayer states that "The purpose of general education is to meet the needs of individuals in the basic aspects of living in such way as to promote the fullest possible realization of personal potentialities and the most effective participation in a democratic society." Like the others, Bode <sup>4/</sup> is getting at the same fundamental truths when he says: "The reconstruction of experience with reference to an ultimate standard of value is the outstanding concern of education." The author

<sup>1/</sup>Leonard V. Koos, The American Secondary School, Ginn and Company, New York, 1927, p. 167.

<sup>2/</sup>Alexander J. Stoddard (Chairman), The Purposes of Education in American Democracy, Educational Policies Commission, Washington, D. C., 1938, p. 47.

<sup>3/</sup>V. T. Thayer (Chairman), Science in General Education, D. Appleton-Century Company, Inc., New York, 1938, p. 23.

<sup>4/</sup>Boyd H. Bode, How We Learn, D. C. Heath and Company, Boston, 1940, p. 277.

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RESEARCH INTERESTS: ORGANIC CHEMISTRY, POLYMER CHEMISTRY,  
AND MATERIALS CHEMISTRY. CURRENT RESEARCH FOCUSES ON THE  
SYNTHESIS AND CHARACTERIZATION OF POLYMER MATERIALS  
WITH CONTROLLED ARCHITECTURE AND FUNCTION. RESEARCH  
INTERESTS INCLUDE THE SYNTHESIS OF BLOCK COPOLYMERS,  
STAR POLYMERS, AND POLYMER NANOPARTICLES. RESEARCH  
INTERESTS ALSO INCLUDE THE STUDY OF POLYMER-PROTEIN  
INTERACTIONS AND THE DEVELOPMENT OF POLYMER-BASED  
MATERIALS FOR BIOMEDICAL APPLICATIONS.

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UNIVERSITY OF CALIFORNIA, BERKELEY, 1992-PRESENT.

believes that secondary education should give a student desirable attitudes toward self, society, and problem-solving, new leads and interests, and the particular knowledges he needs for successful living.

Billett's statement.-- One of the most recent evaluations of the aims of education is by Billett.<sup>1/</sup> He states that in a democracy, citizens must be capable of intelligent behavior, think of their fellow men as much as of themselves, and have similar viewpoints when fully informed on a situation. For a democracy to be successful, each member must recognize that there is a common welfare, realize the cooperative efforts necessary to maintain and improve the society, and be able and willing to cooperate in such efforts.

Summary statement of aims.-- From these seven statements of the aims of education in a democracy, it is apparent that the goal is the development of individuals who will be well-adjusted internally and with the world of people and things around them. It is also apparent that this is to be a society governed by the philosophy of democracy. The author feels that this viewpoint, plus the more detailed statement by Koos,<sup>2/</sup> expresses a workable philosophy of secondary education as well as can be done without going into considerable detail.

Lack of a blueprint.-- The minister who told a member of his congregation: "Don't do as I do; do as I say," appreciated the problem of putting ideals into practice. How is one to put his philosophy of secondary education into actual practice in a real school? Leaving the

<sup>1/</sup>Roy O. Billett, op. cit., pp. 27-34.

<sup>2/</sup>Leonard V. Koos, loc. cit.





translation of generalizations into specific details to the individual reader, we have some answers worth examining.

Koos' viewpoint.-- To achieve the four major aims of education, <sup>1/</sup> Koos believes that the secondary school must perform six functions: achieving a democratic secondary education, recognizing individual differences, providing for exploration and guidance, recognizing the adolescent nature of pupils, imparting knowledge and skills in the fundamental processes, and fostering transfer of training in a limited acceptance of the term. His four aims and six functions review the seven cardinal principles and give one more guidance in the philosophy behind them and the methods by which they may be achieved. Billett, <sup>2/</sup> as one result of a survey, found that the most promising method of providing for individual differences was the unit assignment. This brings us one step nearer to a solution of the problem of how the secondary school should operate to realize its objectives.

Other viewpoints.-- Bode <sup>3/</sup> makes the following interesting statement.

A democratic school may be expected both to give actual experience in democratic living and to foster intellectual insight or understanding of the principle on which democracy is based and which gives it a distinctive character....the function of the school is not merely to conserve the values of the past, but to provide for the continuous reinterpretation of our cultural heritage....School experiences, in brief, should be of such a kind as to widen and enrich and give greater meaning to life as it goes on in the out-of-school environment....The life of the school is designed to

<sup>1/</sup>Leonard V. Koos, loc. cit.

<sup>2/</sup>Roy O. Billett, Provisions for Individual Differences, Marking, and Promotion, Bulletin 1932, No. 17, National Survey of Secondary Education, Government Printing Office, Washington, D. C., 1932, pp. 353-6.

<sup>3/</sup>Boyd H. Bode, op. cit., pp. 247, 272, 298.

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promote such attitudes as consideration for others, a sense of responsibility for the common good, respect for personal property, cooperation involving discussion and free give and take--in a word, the basic attitudes which in the outside world are all too frequently neglected or at best cultivated in a haphazard fashion.

To achieve the aims of secondary education as he has stated them, Billett<sup>1/</sup> believes that the secondary school will be a democracy in miniature, provide for basic similarities and differences in pupils, use the problem-solving approach to all activities, and keep the pupil as long as he can benefit from the school.

A final statement.-- As with the philosophy of secondary education, the viewpoints on how the schools should operate are various approaches to a central situation. All are agreed that secondary schools should operate on a democratic basis. All agree that, making allowances for the age of and differences among pupils, we should develop right attitudes and understandings in pupils through their school experiences, and give them fundamental skills. All imply that there should be more flexibility and articulation with what goes on in our society.

#### Objectives of Science Teaching

General aims.-- Thayer<sup>2/</sup> presents the progressive education viewpoint on science objectives: contribution to personal living, personal-social relationships, social-civic relationships, economic relationships, and reflective thinking. Noll<sup>3/</sup> lists knowledge of environment, health,  
1/Roy O. Billett, op. cit., pp. 41-2.

2/V. T. Thayer, op. cit., pp. 27, 59.

3/Victor H. Noll, The Teaching of Science in Elementary and Secondary Schools, Longmans, Green and Company, New York, 1939, pp. 9, 13-14.



good habits, scientific attitude, scientific method, practical skills, and hobbies. His survey of science aims reported by 130 sources shows an emphasis on knowledge, with appreciations, habits, abilities, interests, and attitudes in descending order of importance in secondary school. Heiss<sup>1/</sup> lists a fund of interpretive understandings, a fund of appreciations, a group of attitudes or mind-sets, and a method of attack on problems. The author believes that the essence of these views may be contained in three aims: to develop the scientific attitude, to teach certain laws and facts, and to develop hobbies.

Biology aims.-- From the general aims of secondary education and the more specific aims of science teaching we now come to the narrower objectives of high school biology. Menzies<sup>2/</sup> has prepared a list of 40 objectives at the college level, but as expected, they are too advanced. At the secondary school level, Billett<sup>3/</sup> decides that "the problem of making their courses as functional as possible in the lives of the pupils" is the chief problem of all secondary school teachers. A suggested list of specific biology objectives is as follows.<sup>4/</sup> (Subdivisions and details are omitted.)

1. Energy cannot be created or destroyed, but merely transformed from one form to another.

1/Elwood D. Heiss, Ellsworth S. Obourn, and C. Wesley Hoffman, Modern Methods and Materials for Teaching Science, The Macmillan Company, New York, 1940, p. 7.

2/Francis D. Curtis, Second Digest of Investigations in the Teaching of Science, P. Blakiston's Sons and Company, Inc., Philadelphia, 1931, pp. 381-4.

3/Roy O. Billett, op. cit., pp. 281-2.

4/Ibid., pp. 269-71.





2. The ultimate source of the energy of all living things is sunlight.
3. Microorganisms are the immediate cause of some diseases.
4. All organisms must be adjusted to the environmental factors in order to survive in the struggle for existence.
5. All life comes from previously existing life and reproduces its own kind.
6. Animals and plants are not distributed uniformly or at random over the surface of the earth, but are found in definite zones and in local societies.
7. Food, oxygen, certain optimal conditions of temperature, moisture, and light are essential to the life of most living things.
8. The cell is the structural and physiological unit in all organisms.
9. The more complex organisms have been derived by natural processes from simpler ones, these in turn from still simpler, and so on back to the first living forms.

Compare this list with New Hampshire requirements. 1/

1. Sufficient motor skill to handle with reasonable dispatch and accuracy apparatus and materials in the laboratory.
2. Knowledge of: a. The basic concepts underlying each unit. b. The essential features of the scientific method. c. The lives and contributions of eminent biologists.
3. Mental skills sufficient to employ the concepts under 2 in the solution of problems at the tenth grade level.
4. a. Ideals of accuracy, carefulness and patience in making observations, framing hypotheses and in arriving at conclusions. b. Eager and open-minded attitude toward new biological truths. c. An interest in biology sufficiently keen to induce observation and further reading both during the course and after its termination.

The basic concepts (2a) are considered to be:

1/Program of Studies Recommended for the Public Schools of New Hampshire, Grades 9 to 12, Part 4, Mathematics and Science, State Board of Education, Concord, New Hampshire, 1931, pp. 117, 119-20.

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TO THE PRESIDENT OF THE UNIVERSITY OF CHICAGO  
FROM THE FACULTY OF THE UNIVERSITY OF CHICAGO  
RESOLUTION OF THE FACULTY OF THE UNIVERSITY OF CHICAGO  
PASSED AT A MEETING OF THE FACULTY HELD AT CHICAGO, ILL.,  
ON THE 15TH DAY OF MAY, 1906.

WHEREAS, the Faculty of the University of Chicago,  
in its meeting of the 15th day of May, 1906,  
has adopted the following resolution:

Resolved, That the Faculty of the University of Chicago,  
in its meeting of the 15th day of May, 1906,  
has adopted the following resolution:

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in its meeting of the 15th day of May, 1906,  
has adopted the following resolution:



1. The adaptation of the organism to its environment.
2. The fitness of all organs to their functions.
3. The germ nature of disease.
4. Conservation of energy as illustrated by assimilation of food in the body and by making of food in plants in photosynthesis.
5. The interdependence of organisms.
6. Living things come from similar living things.
7. The recapitulation of racial development by animals and plants in their development from the fertilized egg.
8. The principle of development.
9. The cell is the structural building unit of living things.
10. The laws of inheritance in relation to the improvement of animals and plants.

Another set of objectives is the Springfield list. <sup>1/</sup>

1. To impart such knowledge of the structure and functioning of the body that the pupils may recognize the importance of hygiene and sanitation.
2. To interest the pupils in living things or in particular groups of plants and animals, and thus afford them the opportunity of acquiring a beneficial hobby.
3. To eliminate common superstitions and ignorant practices, and to correct pseudo-scientific ideas gleaned from commercial literature.
4. To offer intelligent discussion of the various fields of biology for the purpose of educational and vocational guidance, since biology is the basis of so many vocations and professions.
5. To train pupils to make accurate observations and to draw correct conclusions from what they observe.
6. To develop habits of neatness, precision, order, and resourcefulness.

---

1/General Aims of Biology, Statement prepared by The Committee on Re-organization of Curricula of the Springfield, Massachusetts, Public Schools, 1938.

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7. To give a proper understanding of the relationship, evolution, and interdependence of the various forms of life with a view of developing a spirit of tolerance.

8. To encourage in some cases the spirit of scientific investigation.

1/  
Raymond Pearl presents another point of view.

I should regard the five most important general basic things which biology has to contribute as:

1. Organic evolution.
2. The cellular structure of living organisms.
3. Heredity and variation (genetics), including of course, the applications to human problems.
4. Embryonic development and growth.
5. The adaptive and self-regulative capacities of living organisms.

If I could be permitted a sixth heading, it would be metabolism, using this single, and therefore not quite adequate term, to indicate the whole subject of the energy relations of the organism with the external world, and within itself.

The differences between these lists is more quantitative than qualitative, except that the Springfield list is less scientific and more practical, and like the New Hampshire list, includes character goals also sought in the teaching of other subjects.

2/  
The most recent study of biology teaching, by Riddle, includes a list of topics taught, as shown in Table 1. That a sampling of 866 teachers, chosen to be representative of the 3,186 throughout the United States, 1/Ruth M. Weeks (Chairman), A Correlated Curriculum, D. Appleton-Century Company, Inc., New York, 1936, p. 299.

2/Oscar Riddle (Editor), The Teaching of Biology in Secondary Schools of the United States, The Committee on the Teaching of Biology of the Union of American Biological Societies, 1942, pp. 64-6.

On the 1st of January 1881, the following was the  
 result of the examination of the accounts of the  
 year 1880, as shown by the following statement:

Assets of the year 1880, as shown by the following statement:

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States who answered the questionnaire, should submit nearly 3000 different topics as the four or five most important, and that only 23 of these topics were agreed upon by 13 or more of the 866 respondents, is interesting. Whether this indicates lack of uniform quality in biology teaching as well as freedom from the dangers of standardization is up to the reader. That behavior is twentieth in the list, with only 3.4 per cent of the 866 teachers considering it important, may have some bearing on the value of this thesis.

#### Trends in Biology Teaching

Riddle's statement.-- From a study of the data summarized in Table 1, Riddle draws certain conclusions. <sup>1/</sup>

Though the very large amount of highly informative material obtained on this item shows that many teachers of biology throughout the country have a sound grasp of their obligation and opportunity to teach a science, the data as a whole also clearly show widespread tendencies to teach biology not as a science, but (a) as a way to pleasing hobbies, or (b) as a series of practical technologies.... It may be highly desirable....to teach high school pupils a great deal of the very practical in hygiene, in conservation, in economic biology, etc. But....there are two cogent reasons why no one.... of these applications of biology should become a dominating interest during the first one or two years....When taught as a science, the contribution of biology to the education and mental discipline of an educable pupil is incomparably greater than when taught as a smattering of its applications. Second, the biological technologies will hang more superficial than his skin on any pupil smeared with them prior to an introduction to the basic facts which relate and anchor them. This principle is and long has been axiomatic at the college and university level for training in technologies.... the basic sciences first, applications afterward. Unless or until educators....comprehend this principle our secondary school biology will become (or remain?) a happy hunting ground for whims, fads and various forms of so-called practical or useful knowledge. Whatever may be said for the great value to high school pupils of the applications of biology....is in no sense an argument that such teaching should displace the teaching of the science of biology; rather it

1/Oscar Riddle, loc. cit.





Table 1. The First 23 Topics 866 Teachers Throughout the United States Would Emphasize in a High School Course in "General Biology."

Topic	Replies	
	Number	Percent
(1)	(2)	(3)
Health-Disease-Hygiene .....	397	45.8
Physiology .....	263	30.4
Heredity .....	192	22.2
Conservation .....	127	14.7
Structure .....	102	11.8
Genetics .....	90	10.4
Reproduction .....	90	10.4
Taxonomy .....	88	10.2
Ecology .....	88	10.2
Nature Study .....	87	10.0
Environment .....	67	7.7
Insects .....	53	6.1
Nutrition .....	52	6.0
Economic Biology .....	50	5.8
Life Processes .....	49	5.7
Sex Education .....	45	5.2
Evolution .....	39	4.5
Adaptation .....	37	4.3
Eugenics .....	31	3.6
Behavior .....	29	3.4
Scientific Method .....	21	2.4
Photosynthesis .....	13	1.5
Biological Principles .....	13	1.5

is an argument for the addition of one or two more years to the amount of biology now included in the high school curriculum. This addition would permit a study of applications to follow a study of the science.

A survey of ten recent biology textbooks, in Appendix A, seems to show three trends: unit built around social values rather than biologic concepts, less technical material, and more practical material.



This seems to agree with the trend that Riddle decries.

There are trends discernible in other aspects of biology teaching. Riddle<sup>1/</sup> finds a slight decrease in the teaching of biology, particularly in the larger cities, due in part to the substitution of a social study for biology, and the transfer of a biological subject, such as hygiene, to the teacher of physical education. No evolution is taught in more than half of the high schools reporting, and in many places where taught it is "diluted beyond recognition." The inclusion and amount of sex education varies too much for generalization. The genetic inequality of human beings is taught in perhaps four-fifths of the 3,186 secondary schools covered by the survey.

Summary statement.-- The above survey of trends in biology teaching probably presents a brighter picture than what in fact exists. Of nearly 16,000 questionnaires sent, 3,186 were answered. Most of them went to the mailing lists of a large supply house and the National Association of Biology Teachers. Probably several thousand biology teachers received no questionnaire; nearly 13,000 receiving one did not return it.

It is the author's opinion that Riddle, in suggesting two or more years of secondary school biology, following basic science with various applications, agrees with the recommendation of the National Society for the Study of Education in its Thirty-First Yearbook in 1932. Such a sequence is not easy to establish in most schools. The unit presented in this thesis may be an effective compromise. The decision is left to the reader.

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<sup>1/</sup>Oscar Riddle, op. cit., p. 76.

the first of these is the fact that the first of the three  
 conditions is not satisfied. The first condition is that the  
 function  $f$  must be continuous. It is not continuous at the point  
 $x = 0$ , for  $f(0) = 1$  and  $\lim_{x \rightarrow 0} f(x) = 0$ . The second condition is  
 that the function must be differentiable. It is not differentiable at  
 $x = 0$ , for the limit  $\lim_{h \rightarrow 0} \frac{f(0+h) - f(0)}{h}$  does not exist. The third  
 condition is that the function must be twice differentiable. It is  
 not twice differentiable at  $x = 0$ , for the limit  $\lim_{h \rightarrow 0} \frac{f'(0+h) - f'(0)}{h}$   
 does not exist. The function  $f$  is therefore not a solution of the  
 differential equation  $y'' + y = 0$ .

The function  $f$  is a solution of the differential equation  $y'' + y = 0$   
 if and only if it satisfies the three conditions mentioned above.  
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 if and only if it satisfies the three conditions mentioned above.  
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 if and only if it satisfies the three conditions mentioned above.



## CHAPTER II

### AIMS AND NATURE OF THE UNIT ON BEHAVIOR

#### How the Unit Came to Be

A viewpoint on biology teaching.-- Seven years of the teaching of biology, principally to high school sophomores, in two towns and one small city in New Hampshire, leave the writer less certain of what biology should be taught than when he started. No two years have been alike as to methods or content. Certain principles and facts were always included, with varying emphasis and detail; some others were intermittent. The conclusion is drawn that adaptation of methods and content to fit the community, school, and pupils is best, although it puts more responsibility on the teacher.

Evolution of a unit on behavior.-- Among the writer's hobbies is the study of behavior. During his first year of teaching, the unit<sup>1/</sup> on behavior proved unsatisfactory, so a dittoed fifth problem was added. During the next five years, four complete revisions of the unit were made, and it gradually became independent of any one textbook. In the last revision a major problem was to select the best materials and methods, discarding the rest. Not until the seventh year was the unit sufficiently clear-cut and tested to seem worthy of a careful evaluation.

<sup>1/</sup>Arthur O. Baker, Lewis H. Mills, and William L. Connor, Dynamic Biology, Rand McNally and Company, New York, 1933, pp. 522-71.

THE HISTORY OF THE  
CITY OF BOSTON

FROM 1630 TO 1800

The history of the city of Boston, from its first settlement in 1630 to the present time, is a subject of great interest and importance. It is a city which has been the seat of many of the most important events in the history of the United States, and which has played a prominent part in the development of the nation. The city has been the birthplace of many of the most important political and social movements of the country, and has been the center of many of the most important intellectual and cultural activities of the nation. The history of the city is a history of the struggle for freedom and independence, and of the development of the principles of democracy and self-government.

THE HISTORY OF THE CITY OF BOSTON

The city of Boston was founded in 1630 by a group of Puritan settlers who had come to the New World in search of a place where they could live in accordance with their religious beliefs. The city was founded on a small island in the harbor, and was at first a small settlement of about 100 people. However, the city grew rapidly, and by 1640 it had a population of about 1,000 people. The city was the center of the Massachusetts Bay Colony, and was the seat of the colony's government. The city was also the center of the colony's intellectual and cultural life, and was the birthplace of many of the most important political and social movements of the country.

The city of Boston was the center of the American Revolution, and was the site of many of the most important events of the war. The city was the headquarters of the Continental Congress, and was the site of the signing of the Declaration of Independence. The city was also the site of the Battle of the Clouds, and the Battle of the Clouds.

The results of that evaluation suggest that the unit is fundamentally sound, but needs minor improvements. It seems true that alterations would always be desirable, partly because no two classes or teachers are the same.

### The Unit on Behavior

Preliminary statement on the unit.-- The unit on behavior is here presented in four parts: the basic, underlying principle, the more detailed facts and ideas involved in that principle, references for the teacher's use, and the unit assignment as it was placed in the hands of the pupils.

General statement of the unit.-- All living things behave in response to stimuli. Man, by using his intelligence, can guide his living.

Itemized statement, or delimitation, of the unit.--

1. Behavior is everything that a living thing does.
2. Plant behavior is simple. It is based on tropisms: the turning toward or away from stimuli. Plants seem to respond only to chemicals (certain ones), contact, gravity, heat, light, and water. Protozoa, jellyfish, worms, insects, and some other animals seem to have tropisms.
3. Hormones are chemicals which powerfully influence plant and animal behavior. In man, they are made in glands, some without ducts, and in other body organs. The thyroid hormone affects metabolism; those of the pituitary, growth, childbirth, and other functions; of the parathyroids, calcium metabolism; of the adrenals and pancreas, sugar metabolism. Other hormones are made in the pineal and thymus glands,

The first part of the paper is devoted to a general discussion of the problem of the existence of solutions of the system of equations (1) for arbitrary values of the parameters  $\alpha$  and  $\beta$ . It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous and has a bounded derivative.

### 2. THE MAIN RESULTS

In the second part of the paper the existence of solutions of the system (1) is proved for arbitrary values of the parameters  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous and has a bounded derivative. It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous and has a bounded derivative.

The third part of the paper is devoted to a general discussion of the problem of the existence of solutions of the system of equations (1) for arbitrary values of the parameters  $\alpha$  and  $\beta$ . It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous and has a bounded derivative.

In the fourth part of the paper the existence of solutions of the system (1) is proved for arbitrary values of the parameters  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous and has a bounded derivative. It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous and has a bounded derivative.

The fifth part of the paper is devoted to a general discussion of the problem of the existence of solutions of the system of equations (1) for arbitrary values of the parameters  $\alpha$  and  $\beta$ . It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous and has a bounded derivative.

In the sixth part of the paper the existence of solutions of the system (1) is proved for arbitrary values of the parameters  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous and has a bounded derivative. It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if the function  $f(x)$  is continuous and has a bounded derivative.

liver, reproductive organs, and small intestine. Our knowledge of hormones is still scanty.

4. Most plants have no special structures for responding to stimuli. Most animals have a nervous system. Protozoa have the beginnings of a nervous system. The higher and more complex an animal, the greater are the size and complexity of its nervous system. Jellyfish and starfish have the "ring" type nervous system. Worms, insects, and backboned animals have the "ladder" type nervous system.

5. Man's "ladder" type nervous system is usually thought of as two. The central nervous system is the brain (cerebrum, cerebellum, and medulla) and 12 pairs of branch nerves, the spinal cord (two sides of a "ladder" fused into one) and 31 pairs of branch nerves, billions of tiny nerve branches, and organs of hearing, sight, smell, taste, and touch. The automatic <sup>1/</sup>nervous system is two parallel nerve cords (a "ladder"), nerve centers along these cords, and billions of tiny nerve branches. The two systems are connected by the dorsal, sensory roots of the spinal nerves.

6. The higher and more complex an animal, the bigger its brain compared with its body size. The cerebrum, or thinking brain, first appears in fishes, and reaches its highest development in man, which is the chief reason we are superior to all other living things. The outside of man's brain is billions of "gray matter" nerve cells, which have no permanent connections with each other; the inside is "white matter"

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<sup>1/</sup>The word "automatic" is used in preference to the more scientifically correct "autonomic" after experience in using one or the other or both has shown the use of "automatic" by itself to be preferable.





fibers from the "gray matter" cells, which connect these cells with the rest of the body; there are central spaces filled with salt water, and the entire brain seems to act like an electrolytic solution.

7. The cerebrum is the center of consciousness, emotion, intelligence, and memory; the cerebellum influences balance, together with the semicircular canals in the ears; the medulla influences breathing, heartbeat, and similar body activities, and is a relay center; the spinal cord is a relay center. The automatic nervous system regulates the rhythmic work of our internal organs, plus some influence from the medulla. The theory that the brain works in parts, and by pathways, which may extend through the nervous system, and become easier to travel through use, is disproved by recent experiments. Exactly how the brain works is unknown, but it seems to do most of its work as a whole.

8. An inborn reflex is a quick, simple response done without thinking. A person is supposed to inherit about 50 reflexes. A conditioned reflex is a learned response, which may replace or be added to an inborn reflex. A habit is formed by associating a new stimulus or response with an old stimulus or response, or replacing it. Several responses and stimuli may be involved. Habits are best formed and broken when you want to, know how, make no exceptions, and don't think much about it. "Negative practice" is useful in some cases.

9. Sense organs responding to heat, cold, touch, and pain are scattered unequally over the body surface in the skin, and are most numerous in the finger tips. Our hand, with a thumb opposite the fingers, is our second great advantage over most other animals.



10. The tongue has taste buds on its upper surface which react mostly to sweet at the tip, sour at the sides, bitter at the back, and salt all over. All other flavors are due to our sense of smell, centering in the olfactory membranes in the nose. These have a total surface of about one-fourth square inch, while a dog's total about 40 times as much. Our sense of smell is degenerate.

11. Some "deaf" people can hear by the vibration of skull bones, but we hear normally with the ears. Sound waves are collected by the outer ear and ear canal and vibrate the ear membrane; this moves three little bones (hammer, anvil, and stirrup) which are connected with a coiled organ filled with fluid; pulsations of the fluid stimulate tiny, hair-like nerve endings in the coiled organ, which send messages along the auditory nerve to the brain. The eustachian tube connects the mouth with the middle ear where the ear bones are; thus, by opening your mouth when a gun is fired, air waves reach both sides of the ear drum and it is less likely to burst. Thus, also, swimming may force water up into the middle ear and cause partial deafness, mastoid, or sinus trouble. Deafness due to too much wax in the ear canal is the only kind that can ordinarily be cured.

12. The right eye is protected by a conical, bony socket, and moved by six muscles. The eye has three layers: the outer, white, protective, sclerotic coat, which becomes the transparent cornea in front, which helps to focus the eye; the black, thin, choroid coat, which becomes the iris in front, and has a central hole, the pupil, the size of which is regulated by the iris; the inner coat, or retina, covering the





back two-thirds of the eye, which is a complex structure full of nerve endings which react to light and join to form the optic nerve that goes to the left half of the brain. The lens, in back of the iris, focuses the eye, and separates the watery aqueous humor in front from the viscous vitreous humor in back, which fills most of the eye. There is a blind spot in the eye where the optic nerve leaves it. The front of the cornea, and under side of the eyelids, is covered by a thin protective membrane, the conjunctiva. The nictitating membrane, a triangular red spot at the inner corner of the eye, is the remains of a third, translucent eyelid. The left eye is built like the right, but connects with the right side of the brain. One eye usually dominates the other. How we see colors is not yet understood: negative after-image, color-contrast, and color blindness are some known phenominae.

13. Instinctive behavior is most highly developed in insects. Its advantages are food, protection, and a smooth running society; its disadvantages are the lack of adaptability and of individual freedom. Intelligent behavior is most highly developed in man. Its advantages are adaptability and individual freedom; its disadvantages, complexity and a tendency to slip down to the level of habitual behavior.

14. Man has few inborn reflexes and probably no instincts. His great advantage over other animals is his larger cerebrum. This gives him greater ability to form habits, to interpret what his senses tell him (perception), and to learn by association of ideas. Because man is more adaptable than any other animal, human behavior can be changed more than that of other animals.



15. How one learns is not understood, but some kind of mental picture is usually formed. A rested, alert, interested, unbiased mind, aided by various techniques such as concentration, association of ideas, scanning, note-taking, recitation, memorization, and teaching others, learns most effectively.

16. The way in which we act depends upon our surroundings, and upon the kind of body we inherit. Being the most intelligent of animals, we are best able to plan our lives, making the best possible use of inherent abilities, changing our environment and work if necessary so as to reach the worthwhile goals we want. In planning your life, as in forming a habit, the proper attitude, or mind-set, is important in getting started and in carrying on. Some call this "will power."

17. We are always changing: growing up, then growing old, liking childish things, then liking grown-up things. We never stay the same, nor do other animals, nor plants.

18. An emotion is a sensation experienced by the whole body, an aroused state of feeling.

19. Habits, emotions, and reason or intelligence are the three strongest influences on human behavior. Habits control most of our daily life, especially when we are adults. Emotions give to life richness, enthusiasm, and purpose. Reason gives to life form, order, and guidance.

20. Successful living is based on a healthy balance between emotions and reason, with good habits a labor-saver.

21. Much behavior is not yet understood. It is often explained

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supernaturally. Mental telepathy, sleep learning, hypnotism, spiritualism, and reincarnation are fascinating and deserve careful study. The control which the mind can exercise over the body, its ability to remember and solve problems, are commonly underestimated. But the power of mind over body does not seem to be unlimited. Research is difficult, and many fakers make fortunes by fooling the public. There is great opportunity and need for well-trained research workers.

Incidental and indirect learning products.--

1. Man has three basic needs: satisfaction of physical needs, health, and favorable surroundings.
2. The law of cause and effect is a fundamental law of nature.
3. The conditions on earth that make life possible vary only slightly, and result from the dynamic balance of terrific forces.
4. We learn about our surroundings through our senses, and hence know them imperfectly. Man's conception of the true nature of things therefore changes.
5. No two living things are exactly alike.
6. Life is a condition of dynamic unbalance, resulting in a striving toward balance which, when reached, irritates to further unbalance or else results in death.
7. Changes proceed according to the quantum theory, which is expressed in living things by rhythms in physical and mental activities.
8. Facts on the habits and behavior of many plants and animals are now known.
9. There is great variety in the activities, interests, and ideas



the first of these is the fact that the "average" person is not a "typical" person. The "average" person is a statistical construct, a mathematical average of all the people in a population. The "typical" person is a real person, a person who is representative of the population. The "average" person is a mathematical construct, a mathematical average of all the people in a population. The "typical" person is a real person, a person who is representative of the population. The "average" person is a mathematical construct, a mathematical average of all the people in a population. The "typical" person is a real person, a person who is representative of the population.

### THE AVERAGE PERSON AND THE TYPICAL PERSON

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of different people.

10. Mental health is important to a person.
11. A person has tremendous power to guide his living.
12. It is now my determination to guide my living intelligently.

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The unit assignment.-- In a limited sense, the unit assignment consists of the study and activity guide. In a broader sense, it includes other mimeographed materials given to the pupils. The following pages are these materials, and include the pre-test, film study notes, study and activity guide, and final test. These were printed on light-green mimeograph paper with brown ink, trying out a suggestion by Manchester.<sup>1/</sup> To illustrate its effectiveness, a sample sheet is included in this thesis as Appendix E.

#### Behavior Test, 1941-42

The following are multiple choice questions. Select one of the answers as the best one, and put its number in the space to the left of the question.

- \_\_\_ 1. Everything that a living thing does is called: 1--Activity; 2--movement; 3--living; 4--behavior; 5--response.
- \_\_\_ 2. Anything which may produce a response is called: 1--Substance; 2--matter; 3--alive; 4--stimulus; 5--reaction.
- \_\_\_ 3. The physical basis of behavior is: 1--Nerves; 2--protoplasm; 3--coordination; 4--responsiveness; 5--chemical reactions.
- \_\_\_ 4. Turning toward or away from light, heat, water, contact, gravity, and chemicals is called: 1--Irritability; 2--a tropism; 3--reaction; 4--a reflex; 5--sensitivity.

<sup>1/</sup>Harland Manchester, "Meet the Color Engineer," Reader's Digest (June, 1941), 38: 134-5.



- \_\_\_ 5. The type of chemical made in the ductless glands and elsewhere in the body, which plays an important role in our behavior, is: 1--Hormone; 2--sympathin; 3--auxin; 4--acetic acid; 5--lactic acid.
- \_\_\_ 6. The chemical responsible for our pain sense is: 1--Auxin; 2--hormone; 3--acetic acid; 4--histamine; 5--lactic acid.
- \_\_\_ 7. Man's nervous systems are the type known as: 1--Diversified; 2--ladder; 3--ring; 4--specialized; 5--diffuse.
- \_\_\_ 8. The main parts of the central nervous system are: 1--Brain and spinal cord; 2--cerebrum and cerebellum; 3--nerve cords and plexes; 4--cerebrum and spinal cord; 5--brain, plexes, and spinal cord.
- \_\_\_ 9. The center of consciousness, memory, and thinking is the: 1--Medulla; 2--spinal cord; 3--midbrain; 4--cerebellum; 5--cerebrum.
- \_\_\_ 10. The center of balance and muscular coordination is the: 1--Plexes; 2--cerebellum; 3--cerebrum; 4--medulla; 5--semi-circular canals.
- \_\_\_ 11. The chief known function of the sympathetic nervous system is: 1--Control of daily work of internal organs; 2--control of sleeping; 3--unconscious thought; 4--memory; 5--conditioned reflexes.
- \_\_\_ 12. A nerve impulse is: 1--An electric wave which travels 350 feet per second along a neuron; 2--the electro-chemical change which travels along a neuron; 3--the reaction to a stimulus; 4--the desire to do something; 5--the basis of emotions.
- \_\_\_ 13. A reflex action is: 1--A definite response to a definite stimulus; 2--turning toward or away from a stimulus; 3--jerking your hand away from a hot stove; 4--an unlearned, quick, simple response found only in animals; 5--an action that is the reverse of another action.
- \_\_\_ 14. A sensory, associative, and motor neuron make up a: 1--Reflex arc; 2--reflex action; 3--nerve pathway; 4--stimulus-response; 5--neuron.
- \_\_\_ 15. Reflex actions are controlled by the: 1--Brain; 2--sympathetic nervous system; 3--spinal cord and medulla; 4--brain and spinal cord; 5--cerebellum and medulla.
- \_\_\_ 16. The time required to react to a stimulus is called: 1--Response lapse; 2--reaction time; 3--reflex arc; 4--nerve pathway; 5--350 feet per second.

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- \_\_\_ 17. A habit is: 1--Something you learn to do; 2--something you should not do; 3--a response usually learned by repetition and done without thinking; 4--a conscious instinct; 5--something you should do.
- \_\_\_ 18. A habit may be formed by: 1--Attempting to do something until you can do it; 2--associating a new stimulus repeatedly with an old one until the act becomes automatic; 3--thinking about something until you know how to do it; 4--trying to do something the wrong way until you prefer the right way; 5--doing a thing several different ways until one way becomes habitual.
- \_\_\_ 19. Aids in forming a habit quickly are: 1--Have someone watch you and guide you in your practice; 2--no exceptions; 3--strong start, no exceptions, interest, make practice opportunities; 4--practice as often and long as possible; 5--do it the wrong way until the right way is learned.
- \_\_\_ 20. The best way to break a "bad" habit is: 1--Stop it completely; 2--be too busy to find time for it; 3--have someone watch you and stop you every time you do it; 4--gradually do it less and less until you just don't do it any more; 5--replace it with a good one.
- \_\_\_ 21. The process of controlling and stopping one's reaction to a stimulus is called: 1--Self-control; 2--inhibition; 3--repression; 4--frustration; 5--desire.
- \_\_\_ 22. Special structures which receive stimuli from our environment are called: 1--Perceptors; 2--responsive; 3--sense organs; 4--end organs; 5--sensory neurons.
- \_\_\_ 23. The chemical sense to which all but four flavors are due is: 1--Taste; 2--smell; 3--degenerate; 4--touch; 5--sight.
- \_\_\_ 24. The type of reflex which probably controls all insect behavior is: 1--Automatic; 2--unconscious; 3--inborn; 4--conditioned; 5--simple.
- \_\_\_ 25. An instinct is: 1--Complex reaction to a single stimulus; 2--a cat catching a mouse; 3--something you do without thinking; 4--a group of related, inborn reflexes; 5--something you are born with.
- \_\_\_ 26. Instinctive behavior is most highly developed among: 1--People; 2--cats; 3--cattle; 4--insects; 5--social insects.
- \_\_\_ 27. Advantages of instinctive social behavior are: 1--Division of labor and contentment; 2--no worry nor unemployment; 3--food and protection; 4--no labor problems; 5--no war.



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- \_\_\_ 28. To achieve near perfection, insect social life sacrifices:  
1--Education; 2--individual freedom; 3--vacations; 4--family;  
5--government.
- \_\_\_ 29. One major advantage of instinct over intelligence is: 1--Less  
work; 2--smarter reactions; 3--no problems; 4--nothing to learn;  
5--more time.
- \_\_\_ 30. One major advantage of intelligence over instinct is: 1--Able  
to go to school; 2--adaptability to new situations; 3--remember  
what you see; 4--forget what you don't use; 5--social life.
- \_\_\_ 31. One danger in intelligent behavior is: 1--Slip down to level  
of habits; 2--learn harmful things; 3--overwork and go to pieces;  
4--know too much; 5--become too conceited.
- \_\_\_ 32. Instead of waiting for physical evolution, man invented: 1--  
Tools; 2--genes; 3--machinery; 4--government; 5--schools.
- \_\_\_ 33. The unit upon which human social life is founded is: 1--School;  
2--city; 3--county seat; 4--family; 5--marriage.
- \_\_\_ 34. Conditioned reflexes social in nature are called: 1--Etiquette;  
2--customs; 3--taboos; 4--manners; 5--culture.
- \_\_\_ 35. Man's invention which enables him to learn from others as well  
as from experience is: 1--Books; 2--language; 3--radio; 4--tele-  
graph; 5--schools.
- \_\_\_ 36. The two organs which made man's progress rapid are: 1--Brain  
and tongue; 2--head and heart; 3--hands and feet; 4--invention  
and education; 5--cerebrum and hand.
- \_\_\_ 37. One of the most effective ways of learning is: 1--Take notes;  
2--read out loud; 3--form mental pictures; 4--rewrite the ma-  
terial in your own words; 5--recite the material once a week.
- \_\_\_ 38. One of the best ways to understand a new idea is: 1--Connect it  
with something you already know; 2--think it over carefully;  
3--put it in your own words; 4--have it explained with pictures  
and models; 5--try to explain it to someone else.
- \_\_\_ 39. That which partially controls one's behavior by determining his  
capacity to respond to stimuli is: 1--Habits; 2--emotions;  
3--environment; 4--intelligence; 5--heredity.
- \_\_\_ 40. That which partially controls behavior by supplying or failing  
to supply stimuli is: 1--Habits; 2--emotions; 3--environment;  
4--intelligence; 5--heredity.



- \_\_\_ 41. In order to fit into changing conditions and survive a plant or animal must: 1--Adapt itself; 2--be able to learn; 3--modify its usual behavior; 4--migrate; 5--defend itself.
- \_\_\_ 42. The three strongest controls of human behavior are: 1--Past experience, present condition, present surroundings; 2--love, hate, fear; 3--heredity, training, present conditions; 4--intelligence, emotions, habits; 5--heredity, environment, will power.
- \_\_\_ 43. The secret of successful living is: 1--Carefully develop useful habits until you are well-trained for your chosen work; 2--never give up; 3--decide what you want and go after it with all your strength; 4--cooperative balance between intelligence and emotions, with habits a labor-saving device; 5--be alert and adaptable.
- \_\_\_ 44. A state of consciousness still in the experimental stage is: 1--Sleep learning; 2--spiritualistic trance; 3--sleep walking; 4--suspended animation; 5--hypnotism.
- \_\_\_ 45. Things we cannot yet explain are often blamed to the: 1--Government; 2--supernatural; 3--tempo of living; 4--Garden of Eden; 5--depression.

\*Classify the following statements as: A--Scientific Fact; B--Conclusion from Proved Fact; or C--Opinion.

- \_\_\_ 46. Man has greater capacity to develop conditioned reflexes than any other animal.
- \_\_\_ 47. There is great need to improve human social behavior.
- \_\_\_ 48. Thousands of men and women cooperate daily in a large manufacturing plant.
- \_\_\_ 49. Tools have played a very important part in changing human society.
- \_\_\_ 50. Education is one of society's tools whereby each new generation is enabled to begin where the last left off, rather than at scratch, as most other animals do.
- \_\_\_ 51. Human beings can and do learn to cooperate.
- \_\_\_ 52. Most human beings are greedy and selfish and will always remain so.
- \_\_\_ 53. Man will always be the dominant animal on earth.

\*From Exploring Biology, published by Harcourt, Brace and Company.

1. The first part of the report deals with the general situation of the country and the progress of the work done during the year.

2. The second part of the report deals with the results of the work done during the year and the progress of the work done during the year.

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11. The eleventh part of the report deals with the results of the work done during the year and the progress of the work done during the year.



- \_\_\_ 54. You cannot change human nature.
- \_\_\_ 55. War cannot be eliminated from human society.

\*Children seem to be born fearing loud noises. A two-year old child heard a loud noise when he first saw a goldfish bowl, and developed a fear of it. His father tried several remedies: A--He had an older brother show pleasure at sight of the goldfish bowl; B--he told the child repeatedly that the goldfish would not hurt him; C--he gave the child a dish of favorite food and set the goldfish bowl at the far end of the table. Each day he brought the bowl a little nearer.

- \_\_\_ 56. Which of the procedures do you suppose cured the child of his fear? Why? (Explain your reasons on the back of this paper.)
- \_\_\_ 57. Make a clear, labeled diagram of the human eye or ear. (On back.)

Behavior Unit, 1941-42

Film 1

Study Notes: The Study of Infant Behavior (Sound) Name \_\_\_\_\_

1. When was the Yale Psycho Clinic founded? \_\_\_\_\_
2. Why do they study babies instead of school children? \_\_\_\_\_
3. Is the cooperation of parents needed? \_\_\_\_\_
4. How are records of behavior preserved? \_\_\_\_\_
5. How does a 16 weeks old baby react to a ring? \_\_\_\_\_
6. To a red cube? \_\_\_\_\_
7. To a pile of cubes? \_\_\_\_\_
8. To a tiny white sugar pellet? \_\_\_\_\_
9. How does a 44 weeks old baby react to a pile of cubes? \_\_\_\_\_
10. To a tiny white sugar pellet? \_\_\_\_\_
11. To a spoon and cup? \_\_\_\_\_

\*From A Guide to Modern Biology, published by Harcourt, Brace and Company.



12. To cubes and a cup? \_\_\_\_\_
13. To a ring on a string? \_\_\_\_\_
14. Name two ways the film records are used. \_\_\_\_\_
- \_\_\_\_\_
15. What kind of screen is used around the guidance nursery? \_\_\_\_\_
- Why? \_\_\_\_\_
16. Successful child guidance requires also whose guidance? \_\_\_\_\_
17. How many different babies and children have been studied? \_\_\_\_\_
18. Note a typical behavior pattern of a 20 weeks old baby. \_\_\_\_\_
19. 24 weeks. \_\_\_\_\_ 20. 28 weeks. \_\_\_\_\_
21. 32 weeks. \_\_\_\_\_ 22. 36 weeks. \_\_\_\_\_
23. 40 weeks. \_\_\_\_\_ 24. 44 weeks. \_\_\_\_\_
25. 48 weeks. \_\_\_\_\_ 26. 52 weeks. \_\_\_\_\_
27. Why study a baby's physical growth? \_\_\_\_\_
28. Why study a baby's mental growth? \_\_\_\_\_

### Study and Activity Guide

These pages are to guide your study of behavior. Read them carefully. Can you think of other, really interesting things that might be done? Note them on the margin of these pages, and tell me in class or privately.

The teacher will keep a score sheet for each pupil. As soon as you complete each item, bring it in for approval. If incorrect, it will be returned to you for correction. When accepted, it will be so marked on your score sheet.

I suggest that you do the work in the order given, but do not insist on it provided you are prepared for class activities so as to understand them.

Make a real effort do do some of the optional activities. This unit can be one of the most valuable of your school experiences.





Required, Minimum Activities

1. What is behavior? Do you behave only when you are good? Is being bad behaving? Think it over; then look it up in a dictionary. Ask one of your parents for a definition. Work out a new definition.
2. Discuss behavior in class.
3. Take notes on the teacher's lecture on "Tropisms."
4. Do at home experiment 13: Phototropism in house plants. Place the plant so light reaches it from one side, as in a sunny window. Leave it a week, watering when necessary. Then turn the plant around and look at it each day for another week. What happens? Write up the experiment in the usual way. Item 2, score sheet.
5. Take quiz on behavior and tropisms. Item 3, score sheet.
6. Take notes on the teacher's lecture on "Hormones."
7. Discuss hormones in class.
8. Take quiz on hormones. Item 4, score sheet.
9. Prepare a report on one of these plants: sensitive plant, pitcher plant, sundew, Venus' fly trap, bladderwort, walking fern, diatoms. Emphasize behavior and explain how the plant is able to move so rapidly. Item 5, score sheet.
10. Take notes on sound film: "The Nervous System."
11. Take notes on the teacher's lecture on "The Nervous System."
12. On an outline drawing of a person, sketch in one color the brain, spinal cord, and a few branch nerves. In another color sketch the two automatic nerve cords and a few branch nerves. In the corner enlargement sketch the connection between the two systems. On the side view outline of a person's brain shade with pencil the cortex area. Item 6, score sheet.
13. Discuss our nervous system in class.
14. Take quiz on nervous systems. Item 7, score sheet.
15. Do experiment 14: How rapidly do people react? Stand in a circle around a table, hands at sides, a few inches from each other. Teacher stands in circle with stopwatch, taps person on one side, who passes the tap to his neighbor and so on around the circle back to the teacher. The total time divided by the number of people gives the average reaction time per person. Item 8, score sheet.



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16. Do experiment 15: Demonstration of the patellar reflex. Cross your legs and relax. Your partner taps your knee just below the kneecap, using the edge of his hand or a ruler. (Doctors use a rubber hammer.) With a little practice, you can find the exact place to tap. The leg jerks out if you are relaxed. Then try it on your partner.  
Item 9, score sheet.
17. Take notes on the teacher's lecture on "Types of Behavior."
18. Do experiment 16: How can a conditioned response be developed? Drop a golf ball from behind a screen high enough so a person just has time to pull his hand, lying palm down on the table, out of the way when he sees the ball. Click a clicker several times. The person of course does not move his hand. Then drop the ball so that he sees it at the same time that you click the clicker. After some practice, simply click the clicker. He will pull away his hand--a conditioned response. Check up on voluntary inhibition by dropping the ball without clicking--the ball will hit his hand.  
Item 10, score sheet.
19. Make a list of all inborn reflexes you use: waking up to entering school; entering school to recess; recess to leaving school; or leaving school till in bed.  
Item 11, score sheet.
20. Do the same for conditioned reflexes. Then state which were more numerous.  
Item 12, score sheet.
21. Discuss the teacher's story of "Low Bridge."
22. Make a list of all the habits you use during one of the above periods of time. Try to remember when you first formed each habit, and record the date. Tell your partner about any habits or mannerisms he is not aware of and let him do the same for you. Add these to your list.  
Item 13, score sheet.
23. Discuss types of behavior in class.
24. Select a habit you want to form, and explain in detail the best way of forming this habit.  
Item 14, score sheet.
25. Take quiz on types of behavior.  
Item 15, score sheet.
26. Do at home experiment 17: Does the skin give exact temperatures? Use three pans of water: left one hot, middle one lukewarm, right one cold. Hold left hand in hot water, right hand in cold water, for 3 minutes. Then put both hands at the same time into the lukewarm water. What is the immediate reaction of the left hand? Of the right hand?  
Item 16, score sheet.



27. Do experiment 18: What parts of the skin are most sensitive to contact? Use two toothpicks or a compass with a sharp pencil. With your partner's eyes closed, touch his skin with one point, and with both points near together and farther apart. Test each place several times: finger tip, palm of hand, back of hand, forearm, neck, lips, back, etc. What place is most sensitive, that is, can feel both toothpicks when they are closest together?  
Item 17, score sheet.
28. Write your name with a pencil at home. Now hold your thumb alongside your fingers, and do not move it to a position opposite your fingers. If necessary, tie it in place. Try writing your name now. Results? Why? Why is our hand with an opposite thumb one of our greatest advantages over other animals, second only to our large cerebrum?
29. Do at home experiment 19: Where on the tongue do things taste most sweet, sour, bitter, and salt? Use sugar; dill pickle or sour milk; cloves, dandelion green, or bitter medicine; salt. Taste a bit of each at the front, sides, back, and various surface areas of the tongue. Do any taste strongest in one particular area? Do any taste about the same all over the tongue?  
Item 18, score sheet.
30. Take notes on the teacher's lecture on "The Sense of Smell."
31. Do at home experiment 20: Do we taste some foods by smelling of them? Taste bits of onion, apple, and potato, first without holding your nose, then holding your nose. Can you tell them apart easily by taste alone, without smelling of them? Try other foods if you wish.  
Item 19, score sheet.
32. Take notes on the teacher's lecture on "The Ear."
33. Make a diagram showing the important parts of the ear.  
Item 20, score sheet.
34. Do at home experiment 21: How far away can you hear a watch ticking? Stop up one ear while testing the other.  
Item 21, score sheet.
35. Take notes on the teacher's lecture on "The Eye."
36. Make a diagram showing the important parts of the eye.  
Item 22, score sheet.
37. Do experiment 22: Is there a blind spot in each eye? Make a cross not over  $\frac{1}{4}$  inch in diameter. Exactly  $3\frac{1}{2}$  inches to its right, make a circle the same size. Close your left eye and look at the cross with your right eye, seeing the circle "out of the corner of your







eye." Hold the paper up in front of you at eye level and about 18 inches away. Move it slowly to the right. At some point the circle will disappear, and then reappear as you continue to move the paper. If not, move the paper to the left. Now close your right eye and look at the circle with your left eye, seeing the cross "out of the corner of your eye." Again hold up and move the paper. At some point the cross will disappear. Item 23, score sheet.

38. Do experiment 23: Which of my eyes is dominant? Make a cone of your experiment paper, with the big end covering both eyes completely. Look at the teacher's hand through the cone. The teacher will tell you which eye "pointed" the cone, or dominated.

Item 24, score sheet.

39. Do experiment 24: What is a negative after-image? Look hard at a bright patch of red for one minute. Close your eyes. What color do you see? Why is this called a "negative after-image"? This may be done with green, blue, or yellow.

Item 25, score sheet.

40. Do experiment 25: What is color contrast? Look hard at a bright patch of red on a neutral (grey) background. In a short time, what color do you see as a rim around the red? Why is this called "color contrast"? This may be done with green, blue, or yellow.

Item 26, score sheet.

41. Take quiz on the sense organs.

Item 27, score sheet.

42. Discuss in class the advantages and disadvantages of instinctive and intelligent behavior.

43. Do experiment 26: What is perception? Follow teacher's directions in looking at cube, stairs, cubes, and face. Discuss perception.

Item 28, score sheet.

44. Take notes on the teacher's lecture on "Ways of Learning."

45. Do experiment 27: Is thinking work? Pupil lies on a plank balanced on a blunt wedge. The teacher gives the pupil a problem in mental arithmetic. What happens? Explain.

Item 29, score sheet.

46. What physical and mental traits did you inherit from your father, from your mother, and from your grandparents. Ask them to help you with this. List the traits in three columns.

Item 30, score sheet.

47. Discuss in class the saying: "Well begun is half done."

48. Do you remember your first day in a summer camp or a new school? How and why did you change your behavior? Do you remember when you

1. The first part of the report is devoted to a general survey of the situation in the country. It is found that the country is in a state of general depression, and that the people are suffering from want and distress. The cause of this is attributed to the war, and the consequent destruction of property and the loss of life.

2. The second part of the report is devoted to a description of the various districts of the country. It is found that the districts are all in a state of general depression, and that the people are suffering from want and distress. The cause of this is attributed to the war, and the consequent destruction of property and the loss of life.

3. The third part of the report is devoted to a description of the various districts of the country. It is found that the districts are all in a state of general depression, and that the people are suffering from want and distress. The cause of this is attributed to the war, and the consequent destruction of property and the loss of life.

4. The fourth part of the report is devoted to a description of the various districts of the country. It is found that the districts are all in a state of general depression, and that the people are suffering from want and distress. The cause of this is attributed to the war, and the consequent destruction of property and the loss of life.

5. The fifth part of the report is devoted to a description of the various districts of the country. It is found that the districts are all in a state of general depression, and that the people are suffering from want and distress. The cause of this is attributed to the war, and the consequent destruction of property and the loss of life.

6. The sixth part of the report is devoted to a description of the various districts of the country. It is found that the districts are all in a state of general depression, and that the people are suffering from want and distress. The cause of this is attributed to the war, and the consequent destruction of property and the loss of life.

7. The seventh part of the report is devoted to a description of the various districts of the country. It is found that the districts are all in a state of general depression, and that the people are suffering from want and distress. The cause of this is attributed to the war, and the consequent destruction of property and the loss of life.

8. The eighth part of the report is devoted to a description of the various districts of the country. It is found that the districts are all in a state of general depression, and that the people are suffering from want and distress. The cause of this is attributed to the war, and the consequent destruction of property and the loss of life.

9. The ninth part of the report is devoted to a description of the various districts of the country. It is found that the districts are all in a state of general depression, and that the people are suffering from want and distress. The cause of this is attributed to the war, and the consequent destruction of property and the loss of life.

10. The tenth part of the report is devoted to a description of the various districts of the country. It is found that the districts are all in a state of general depression, and that the people are suffering from want and distress. The cause of this is attributed to the war, and the consequent destruction of property and the loss of life.

cut out paper dolls, wore dresses, or played with dolls? Has your behavior changed? Do you know anybody who has not changed in some ways during the years you have known him? Did you ever have a pet that did not change? Do trees change? Do your friends always change or "grow up" at the same rate, and to the same extent? What do you honestly think you will be like ten years from now?

49. Can human behavior be changed? Prepare all the arguments you can think of on both sides of this question. Discuss this question in class.
50. Make a four column paper. In column 1, list everything you could do at the earliest age you can remember, and state the age. In column 2, list the ways in which your behavior is affected or limited by the physique you inherited. In column 3, list the ways in which your behavior is affected or limited by your environment. In column 4, summarize what you have learned about changing human behavior.  
Item 31, score sheet.
51. Discuss emotions in class.
52. Contrast a New England Thanksgiving with a New Orleans Mardi Gras or with an Evening at Revere Beach or Canobie Lake. Evaluate the importance of habit, emotion, and reason. Item 32, score sheet.
53. When have you been completely happy? Why were you happy? In the same situation now, would you be completely happy? What are the results of giving the emotions free play? What results from living in a rut year after year? How is a person affected who moves constantly from job to job and town to town? Discuss these questions in class.
54. From what you now know and believe, exactly what would you like to change in your behavior? Item 33, score sheet.
55. Take quiz on controlling behavior. Item 34, score sheet.
56. What is hypnotism? How is it used? How might it be used? What is spiritualism? What proofs have we to support it? What is sixth sense? How much control has the mind over pain? What makes a person go crazy? Discuss these questions in class.
57. Take the final test on behavior. Item 35, score sheet.
58. Discuss the final test, and the behavior unit, in class.
59. Give final special reports.
60. Make a list of the real values to you of this study of behavior. Be frank and honest: this item will not affect your mark.  
Item 36, score sheet.

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### Optional, Related Activities

#### FOR A GROUP:

#### Dramatizing

1. Debate: "The human nervous system is superior to all others."  
Have three people on a side. Each side will make two 3 minute talks, and one 1 minute rebuttal. Accuracy, quoting authorities, presentation, class reaction, and teacher will select winner.
2. Debate: "The automatic nervous system is not as important as the central nervous system."
3. Elect a chairman, who will help you select your part of the work, find information, plan the report, time it, decide the order in which the reports will be given, and announce the reports, instead of giving a report himself. Use diagrams and pictures when possible. Limit reports to 1 minute each. Study a part of the nervous system.
4. With a chairman as described above, find out all you can about in-born human reflexes. Demonstrate as many as you can.
5. In the same way, find out about one of the following: instincts; the sense of smell and shape of noses in different animals; nature of visible light, including Angstrom Units, color theories, color-blindness; the psychological effects of colors on people; eye disorders and diseases and known treatments; how a community or country would live if the people had the inborn reflexes and instincts of bees; how such a society would react, and with what success, if attacked by Hitler; what evidence we have for and against the theory that we inherit four types of instincts: nutritive, defensive, reproductive, and social; the behavior habits in our town today that are unlike the behavior of 20 years ago, acting out the behavior then and now (get help from parents and neighbors).
6. Dramatize the behavior of a person who is responding only with the automatic nervous system.
7. Dramatize the behavior of a person who is responding with all of both nervous systems except the cerebrum.
8. Plan a propaganda stunt working on the emotions. Consult the teacher if you need ideas, and to make sure the stunt you select is all right. Then try it on the class.
9. Plan a voodoo session, copying one or making one up. Get the teacher's approval, and have a session.



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Experimenting

10. Do green plants turn toward all colors of light? Use three boxes, one with clear, one with blue, and one with red cellophane window. Put a plant inside of each box, water it, and keep in the sun for one week.
11. Devise an experiment to test positive phototropism in moths.
12. Grow two small pots of oat seedlings in a light-tight box, each with a cellophane window. Break off tips of one plant. (Be sure window lets light reach what is left of plant stem.) Water both daily, and note results.
13. Experiment with an earthworm's reaction to mild electric shock, vinegar, salt water, sugar water, heat, cold, gentle pinching, or other stimulus.
14. Experiment to see if an animal with a simple nervous system, such as an earthworm, can react as rapidly to a simple stimulus as an animal with a more complex nervous system, such as a frog or rat.
15. Condition frogs or white rats to react differently to the same stimulus.
16. Develop a conditioned reflex in a dog or other tame animal. Then try to inhibit it.
17. Test the comparative value of reward and punishment by teaching a dog to shake hands by rewarding it with a bit of food for every correct response; train another dog by punishing it slightly for every wrong response. Which method seems more successful? Is this sufficient proof?
18. Are all points on the skin sensitive to the same stimulus? Mark off 1 square inch on your forearm. Heat the blunt end of a needle. Touch various places in the square. Mark with a tiny dot each place you feel heat. Now cool the pin on ice and repeat, using a tiny cross for each place you feel cold. Are the places the same?
19. Are pressure and pain felt by different nerve endings? Do as above, using a dot for pressure points and a cross for pain. Use a pencil eraser for pressure and a needle point or pointed wire carrying a mild electric current or dipped in acid for pain.
20. Collect in small bottles or phials cider, milk, water, vinegar, vanilla, grapefruit juice, ammonia, carbon tetrachloride, naphthalene, oil of cloves, oil of wintergreen, gasoline, Canada balsam, attar of roses, or other substances. Blindfold in turn each member

MEMORANDUM

TO : THE SECRETARY OF THE ARMY  
FROM : THE CHIEF OF STAFF  
SUBJECT: [Illegible]

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of the group and let him sniff and guess what each is. Select the three best guessers, and experiment to find out if, with the substances you select to use, there is any best order to recognize the most odors. Try using gasoline first. Results?

21. Work in pairs and make a color sensitivity chart of your eyes for some one color. See teacher for details.

### Modeling

22. Make a model of the central, or of the automatic nervous system, using glass tubing, etc.

### Reports

23. List all customs in your group or circle of friends, or in your town. How many seem useful? How many seem silly and outgrown?
24. Have a "jam session" with some close friends on the importance of habit, emotion, and reason. Can you reach any conclusions?
25. From social studies, English, reference, or other books, or any other source, try to find out how each of the following events changed human society and social behavior:
 

Spread of Christianity	Invention of the Printing Press
The Crusades	The French Revolution
The American Revolution	Invention of the Automobile
Invention of the Airplane	Invention of Refrigeration
Germ Theory of Disease	Free Public Education
Telephone	Radio

FOR AN INDIVIDUAL:

### Dramatizing

1. Write a humorous story about the effect of conditioned reflexes.
2. Write a story about the meeting of a well-bred young man with a pre-historic cave man, pointing out the effect of conditioned reflexes in behavior.
3. Analyze some political speech, other speech, or newspaper story for propaganda and emotional appeal; give it in class and note the reaction.

### Drawing

4. Sketch for comparison the nervous systems of the earthworm, fish, and frog. Note differences and similarities.

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5. Make a diagram of one of the following: automatic nervous system; central nervous system; olfactory membranes and adjacent nose areas. Label neatly.
6. Make a chart or set of charts showing brain structure.
7. Make a chart of a diagram in Murphy's book: p. 214, cube, p. 214, stairs, or p. 256, cubes.
8. Help the teacher make a Phi-phenomenon face.

### Experimenting

9. Try combinations of the four basic flavors to find a place on the tongue where all four taste mildest.
10. Devise and use a test to find out if there are any taste buds on the under side of the tongue.
11. Hang a small potted geranium upside down and watch the growing stem tips. What response do they make? What stimulus produced the response?
12. Pin a few soaked lima beans to a softwood strip and put in  $\frac{1}{2}$  inch of water in a closed quart jar. After roots sprout, turn the stick other end up, note the date, and watch for the roots' response. Repeat the turning.
13. Try to make a plant respond to a stimulus not listed as producing a tropism. Will the plant respond?
14. Try to raise a plant under artificial light.
15. Dissect an etherized frog to locate the sciatic nerve; pinch one with tweezers and note reaction in leg; touch wire from dry cell to a leg muscle and touch the nerve above the muscle with wire from other dry cell pole. Reaction? Cut the nerve and try again. Results?
16. Can you find a flavor not one of the four basic flavors nor a combination of them, that the tongue can taste with the sense of smell?
17. How can you prove you have eustachian tubes? Hold your nose, and try (not too hard at first) to swallow. How does this prove that you have eustachian tubes?
18. How can you see a hole in your hand? Make a pipe of paper; hold it up to one eye, close the other, and place your other hand at the end of the tube, palm toward you, one edge of the hand just touching the outside of the tube. You must not be able to see the hand

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AND IRELAND CHARLES THE SECOND

BY JOHN BURNET

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LONDON, Printed by J. Sturges, at the

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through the tube. Open your other eye. What do you seem to see? If unsuccessful, try again. Be sure to "relax" your eyes.

19. To see blood corpuscles without a microscope, look at the bright sky, or a distant bright light. Tiny specks, usually black, appear and vanish. They are red corpuscles passing through the capillaries in the cornea or conjunctiva. Do not confuse these with "flying fish": little, contorted, clear threads that float in front of your eyes sometimes and are caused by eyestrain.
20. Get a negative after-image with your eyes shut, and try to "blow it out" by a loud whistle.
21. Demonstrate the Young-Helmholtz color theory by looking at a distant object through a stereoscope, green cellophane over one window and red over the other. The object should appear yellow.
22. How sensitive is the palm of your hand? Spread your fingers on paper, trace the outline, and test the palm with a toothpick to find the most sensitive spots. Mark each on the paper outline. Do you find any areas that are most sensitive?
23. Make a pinhole camera. See Exploring Biology, by Ella Smith, p. 613, activity 5, or teacher for Eastman Kodak instructions.

#### Modeling

24. Using clay, plasticene, or modeling wax, make a model of: the eye, ear, nose, eye moved by its six muscles, brain of man, dog, cat, bird, reptile, frog, fish, insect, or earthworm.

#### Reports

25. Is there any connection between the size of an animal and the size of its nervous system?
26. Classify as habit, emotion, or reason, on a three column paper, all that you do: waking up to entering school; entering school to recess; recess to leaving school; or leaving school till in bed. Decide which is most important.
27. Explain to a younger brother, sister, or friend how the ear is built and works. Find out what he (or she) learned. Write a report, telling who he is, what you did, how much he seemed to learn, how much you learned by teaching him, what you would do differently another time.
28. Explain the eye in the same way. Report as above, adding what you did differently, how much of an improvement this was, and what you

1. The first part of the report deals with the general situation of the country and the progress of the work during the year.

2. The second part of the report deals with the results of the work done during the year, and the progress of the various projects.

3. The third part of the report deals with the financial statement of the year, and the progress of the various projects.

4. The fourth part of the report deals with the results of the work done during the year, and the progress of the various projects.

5. The fifth part of the report deals with the financial statement of the year, and the progress of the various projects.

6. The sixth part of the report deals with the results of the work done during the year, and the progress of the various projects.

7. The seventh part of the report deals with the financial statement of the year, and the progress of the various projects.

8. The eighth part of the report deals with the results of the work done during the year, and the progress of the various projects.

9. The ninth part of the report deals with the financial statement of the year, and the progress of the various projects.

10. The tenth part of the report deals with the results of the work done during the year, and the progress of the various projects.

11. The eleventh part of the report deals with the financial statement of the year, and the progress of the various projects.

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13. The thirteenth part of the report deals with the financial statement of the year, and the progress of the various projects.

14. The fourteenth part of the report deals with the results of the work done during the year, and the progress of the various projects.

15. The fifteenth part of the report deals with the financial statement of the year, and the progress of the various projects.



would do differently another time.

29. Find out how the cerebellum and semicircular canals cooperate.
30. Find out the exact effect of alcohol on the cerebellum and semicircular canals.
31. Try to explain nest building in birds in terms of stimulus and response.
32. Keep a record of an older pup or kitten, noting each new conditioned response it develops. Name the stimulus or stimuli in each case.
33. Study a newborn kitten, pup, pig, calf, chicken, or etc. for  $\frac{1}{2}$  hour, recording everything it does. How many different inborn reflexes do you find? Any influence of environment? Any individual differences?
34. Study baseball records and stories; report every specific mannerism of a pitcher that "gave away" the pitch to his opponents.
35. Make a similar study of habits or mannerisms of your teachers.
36. Visit a large factory and note how division of labor speeds production. Explain in terms of habits.
37. Is our skin as efficient for sensation as it could be? Why not have just two types of sense organs: one for temperature and one for pressure?
38. What proofs have we that our sense of smell is degenerate?
39. Prepare a one minute report on how the eye muscles work.
40. Study a hive of bees or an ant hill and see if you can discover certain facts about their behavior.
41. Look up the life of some social insect, and imagine yourself one. What about the life would you like? Dislike?
42. Try to find a dog or cat that you can't "stare down."
43. Find an animal trainer or story about him, and find out how he does it. Is ability to "stare down" the animals important?
44. Make a list of what tools or machines or their products you use during one day or part of a day. Think carefully. When through, how fully do you seem to depend upon tools and machines?



# THE HISTORY OF THE UNITED STATES

CHAPTER I. THE DISCOVERY OF AMERICA. The first discovery of America was made by Christopher Columbus in 1492. He sailed from Spain in search of a westward route to the Indies, and on October 12, 1492, he landed on the island of San Salvador in the West Indies.

CHAPTER II. THE EARLY SETTLEMENTS. The first permanent European settlement in North America was founded by the Pilgrims in 1620 at Plymouth, Massachusetts.

CHAPTER III. THE GROWTH OF THE COLONIES. The colonies grew rapidly in population and wealth during the 17th and 18th centuries. By 1776, there were over 2.5 million people living in the thirteen colonies.

CHAPTER IV. THE REVOLUTIONARY WAR. The Revolutionary War began in 1775 and ended in 1783. The colonists fought for independence from British rule, and on September 3, 1783, the British evacuated New York City and fled to Canada.

CHAPTER V. THE CONSTITUTION. The Constitution was drafted in 1787 and ratified in 1789. It established the framework of the federal government and the rights of the states.

CHAPTER VI. THE WESTERN EXPANSION. The United States expanded westward during the 19th century, acquiring new territories and states.

CHAPTER VII. THE CIVIL WAR. The Civil War was fought from 1861 to 1865. It was a conflict between the Union and the Confederacy over the issue of slavery.

CHAPTER VIII. THE RECONSTRUCTION. Reconstruction was the period from 1865 to 1877 when the Southern states were reintegrated into the Union. It was a time of significant social and political change.

CHAPTER IX. THE GROWTH OF THE UNITED STATES. The United States continued to grow in size and power during the 19th century, becoming a world power.

CHAPTER X. THE SPANISH-AMERICAN WAR. The Spanish-American War was fought in 1898. It resulted in the United States acquiring territories in the Caribbean and the Pacific.

CHAPTER XI. THE WORLD WAR. The United States entered World War I in 1917 and World War II in 1941. These wars had a profound impact on the world and the United States.

CHAPTER XII. THE COLD WAR. The Cold War was a period of tension between the United States and the Soviet Union from 1945 to 1991. It was a time of global conflict and nuclear arms race.

CHAPTER XIII. THE PRESENT. The United States continues to be a major world power, facing new challenges in the 21st century.

CHAPTER XIV. THE FUTURE. The future of the United States is uncertain, but it remains a nation of hope and opportunity.

CHAPTER XV. THE CONCLUSION. The history of the United States is a story of growth, struggle, and achievement. It is a story that continues to shape the world today.

45. List all the advantages of instinctive living, or of intelligent living, that you can think of. Condense these under a few main headings.
46. What dangers can you think of to intelligent, purposeful living from the fact that man can easily form many habits?
47. Write a paper on one of the following: "Why man needs education and bees do not"; "How my family applies the principle of division of labor"; "Why insects cooperate more fully than human beings"; "Why I would rather be a human being than an ant."
48. From social studies, English, reference, or other books, or any other source, try to find out how each of the following events changed human society and social behavior:
- |  |                          |
|--|--------------------------|
| Invention of Gang Plows and Huge Harvesting Machines |                          |
| Discovery of How to Vulcanize Rubber                 |                          |
| Discovery of America                                 | Invention of Gunpowder   |
| Discovery of Evolution                               | Invention of Mathematics |
| Discovery of Chromosomes                             | Invention of Cotton Gin  |
| Invention of Barbed Wire                             | Invention of Telegraph   |

#### References

##### BOOKLETS:

-----	<u>Care of the Eyes</u>
-----	<u>Hearing</u>
Merrill	<u>Marihuana</u>
Porter, Lee	<u>Stimulating the Growth of Plants by the Use of Artificial Light</u>
Rowell	<u>On the Trail of Marihuana</u>

##### BOOKS:

Allee	<u>Animal Life and Social Growth</u> (Group behavior)
-----	<u>Book of Popular Science</u> (Vol. XV, index, for topics)
Butler	<u>Erewhon</u> (pp. 232-271 on effects of machine age on man)
Carrel	<u>Man, The Unknown</u> (a famous book on man's activities)
Carrington	<u>Spiritualism--A Fact</u> (also see Walsh)
Chace	<u>Look at Life!</u> (reference on life habits of many animals)
Chase	<u>Men and Machines</u> (compare with Butler)
Dorsey	<u>Man's Own Show: Civilization</u>
Dorsey	<u>Why We Behave Like Human Beings</u> (excellent)
East	<u>How to Train Dogs for the Home, Stage, and Moving Pictures</u>
Flint, Metcalf	<u>Insects, Man's Chief Competitors</u>
Harwood	<u>How To Work With People</u> (skim for good ideas)
Hogben	<u>Science for the Citizen</u> (pp. 1001-1034, 1055-1061)
-----	Holy Bible (Book of Daniel, Chapter 6, Verses 16-23)
Howard	<u>The Insect Menace</u> (see also Flint and Metcalf)

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Jacobson	<u>You Can Sleep Well</u> (14 points to aid in sleeping)
Jastrow	<u>Wish and Wisdom</u> (good reference on spiritualism and fakes)
Lotz	<u>Creative Personalities</u> (lives of Christian men)
Patri	<u>White Patch</u> (the world through an ant's eyes)
-----	<u>The Reader's Digest Twentieth Anniversary Anthology</u> (articles starting on pp. 5, 8, 14, 48, 85, 104)
Rhine	<u>New Frontiers of the Mind</u> (Duke University experiments)
Root	<u>The ABC and XYZ of Bee Culture</u>
Schriftgiesser	<u>Families</u> (famous Americans and how they "happened")
Sheldon	<u>The Progress of Science</u> (Color comparator; Gesell; Hooton; Inventions--tester of cross-eyes; Electroencephalography; Neuroses in animals; Protoplasmic streaming; Psychology; Vitamin; Zoology--peck-order in chickens, homing experiments on birds, and cold light)
Stoker	<u>Famous Imposters</u> (spiritualist fakes; see also Jastrow)
Snyder	<u>Biology in the Making</u> (pp. 349-367; 368-392; 393-410)
Thompson (Ed.)	<u>The Book of Knowledge</u> (p. 7609 starting with "The Forest of Nerves Within Us" through p. 7612 give references to articles throughout the 20 volumes. This is the School Subject Guide supplement beside Vol. XX)
Walsh	<u>Spiritualism--A Fake</u> (also see Carrington)
Wells	<u>Men Like Gods</u> (imaginative story of race of supermen)
Wells	<u>Short Stories</u> ("Time Machine," p. 7; "Empire of Ants," p. 104; "Country of the Blind," p. 190)
Wells	<u>Star-Begotten</u> (evolution of a race of supermen)
Wells, Huxley	<u>The Science of Life</u> (Vol. I, pp. 97-139; Vol. II, pp. 1288-1317, 1318-1389, 1102-1435, 1436-1478)
Wheeler	<u>Ants</u>
Woodruff	<u>Foundations of Biology</u> (fourth edition)

## MAGAZINES:

## THE AMERICAN BIOLOGY TEACHER

Clarke	"Light as a Limiting Factor for Aquatic Animals and Plants"
Hutton	"The Endocrine Glands" (hormones)
Jeffers	"The Migrations of Fishes"

## THE ATLANTIC MONTHLY

P. A.	"I Have Everything" (Excellent proof of what you can do with your life)
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## THE READER'S DIGEST

Arnold	"How Monopolies Have Hobbled Defense" (live dangerously)
Bliven	"The Body's Mysterious Chemicals" (hormones, enzymes, vitamins)





Bliven	"Our Future as the Scientists Foresee It"
Bliven	"Science--Defender of Democracy" (young men invent)
Calkins	"Sixth Sense" (some unsolved behavior problems here)
Canfield	"I Do Not Like Thee, Dr. Fell" (you can't attract everybody)
Carrel	"Prayer is Power"
Collins	"Wanted--For the American Army: Youthful Leadership and Promotion by Merit" (also see Arnold)
Cronin	"Reward of Mercy" (also, Baum--"The Lesson of the Old Sock")
Cronin	"The Turning Point of My Career" (first master yourself)
Davis	"Youthful Go-Getters Galore!" (you can get busy, too)
Devoe	"Strange Senses" (more unsolved behavior problems)
Dickinson	"My Air Duel With Bruno Mussolini" (never give up!)
Eckstein	"Do Animals Think?" (more unsolved behavior problems)
Heard	"How to Tame Dragons" (is Hitler trying the wrong technique?)
Herold	"Too Much Going On" (slow down and really enjoy life)
Kelly	"They Wouldn't Believe That the Wrights Had Flown" (seeing is not always believing)
Ketcham	"Color Schemers" (how many different colors are there?)
Kettering	"The World Has Just Begun" (this is where you come in)
Kyne	"The Go-Getter" (again, never give up)
Lippmann	"America's Great Mistake" (live dangerously)
Long	"The Silver Thimble" (also, Rodell--"My Debt to the Town Drunk"--advice on life from those who know)
MacLeish	"Look to the Spirit Within You" (attitudes are important)
Manchester	"Meet the Color Engineer" (also see Ketcham, and this paper)
McEvoy	"As the Quiz Kids Were Bent" (home training counts)
McEvoy	"70 Percent Is Not Passing" (not in real life)
Melville	"The Scent of Fear" (also see Heard)
Poncins	"Kabloona" (also see Herold)
de Rougemont, Muret	"A Lesson from the Swiss Army" (real democracy)
Sondern	"The Brainpower of Hitler's Army" (also see Arnold, Collins, Lippmann)
Stern	"Our Ailing Mental Hospitals"
Wharton	"Fraternity in a Factory" (also see Heard and Melville)
Wiggam	"Do Your Eyes See Alike?"

## LIFE

-----	"Glaucoma" (commonest eye disease)
-----	"The Great Nijinsky Dances Again in a Swiss Insane Asylum"
-----	"Psychology Professor Hypnotizes Student in Class Demonstration" (also see November 10 issue on hypnotism)
-----	"'Sixth Sense' of Blind is Discovered to be Hearing"
-----	"Spiritualism" (also see Jastrow, Stoker)
Stockly	"Hooton of Harvard"

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### APPENDIX

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## TEXTBOOKS:

Baker-Mills	<u>Dynamic Biology</u> (pp. 522-571)
Bush-Dickie-Runkle	<u>A Biology of Familiar Things</u> (pp. 74-98)
Curtis-Caldwell-Sherman	<u>Everyday Biology</u> (pp. 412-467)
Downing-McAtee	<u>Living Things and You</u> (pp. 516-547)
Hunter	<u>Life Science</u> (pp. 234-267, 312-317, 323-341, 355-357)
Kroeber-Wolff	<u>Adventures With Living Things</u> (pp. 358-407, 764-766)
Smith	<u>Exploring Biology</u> (pp. 579-658)
Smith-Weber	<u>A Guide to Modern Biology</u> (pp. 175-214)
Wood-Carpenter	<u>Our Environment</u> (pp. 372-393, 549-610, 692-725, 915-965)

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To W. A. Bousfield from his article in the American Biology Teacher (December, 1939), for the idea of required activity 18.

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To Dr. Howard L. Kingsley for the idea of individual activity 8.

To Gardner Murphy from his book A Briefer General Psychology (Harper and Brothers, 1935) for the idea of individual activity 21 (pp. 156-157).

To Ella T. Smith from her book Exploring Biology (Harcourt, Brace and Company, 1938), for optional group activity 25 (pp. 654-655), individual activities 23 (p. 613), 47 (p. 654), and 48 (pp. 654-655); for the idea for group activities 12 (p. 592), 13 (p. 593), 16 (p. 682), 17 (p. 628), 23 (p. 654), and 31 (p. 613), individual activities 4 (p. 614), 11 and 12 (p. 592), 15 (p. 613), 31 (p. 592), 32 (p. 628), 33 (p. 628), 36 (p. 654), 40 (p. 653), 44 (p. 654), and part of 24 (p. 614); and for some ideas on required activity 26 (p. 613).

To Smith and Weber, from their workbook A Guide to Modern Biology (Harcourt, Brace and Company, 1941), for the idea of group activities 10 (p. 177), 18 (p. 189), and 19 (p. 189).





Score Sheet

Pupil \_\_\_\_\_ Class Rank \_\_\_\_\_ Mark \_\_\_\_\_

Key to errors: S--Spelling; P--Punctuation; G--Grammar;  
 ?--Doubtful Meaning; --Incomplete.

Item	Date	Attempts		Mark
		1	2	
1. Pre-Test				
2. Exp. 13: Phototropism				
3. Quiz 1: Behavior and Tropisms				
4. Quiz 2: Hormones				
5. Plant Report				
6. Nervous System Diagrams				
7. Quiz 3: Nervous Systems				
8. Exp. 14: Reaction Time				
9. Exp. 15: Patellar Reflex				
10. Exp. 16: Conditioned Reflex				
11. My Inborn Reflexes				
12. My Conditioned Reflexes				
13. My Habits				
14. Forming a Habit				
15. Quiz 4: Types of Behavior				
16. Exp. 17: Skin Temperatures				
17. Exp. 18: Skin Touch				
18. Exp. 19: Tongue Taste				
19. Exp. 20: Taste by Smell				





Score Sheet (cont.)

Pupil \_\_\_\_\_ Class Rank \_\_\_\_\_ Mark \_\_\_\_\_

Key to errors: S--Spelling; P--Punctuation; G--Grammar;  
 . ?--Doubtful Meaning; --Incomplete.

Item	Date	Attempts		Mark
		1	2	
20. Ear Diagram				
21. Exp. 21: Hear a Watch Tick				
22. Eye Diagram				
23. Exp. 22: Blind Spot				
24. Exp. 23: Eye Dominance				
25. Exp. 24: Negative After-Image				
26. Exp. 25: Color Contrast				
27. Quiz 5: Sense Organs				
28. Exp. 26: Perception				
29. Exp. 27: Is Thinking Work?				
30. My Heredity				
31. Changing Human Behavior				
32. Three Behavior Controls				
33. Changing My Behavior				
34. Quiz 6: Controlling Behavior				
35. Final Test				
36. Value of Unit to Me				



Film 2Study Notes: The Nervous System (Sound) Name \_\_\_\_\_

1. What characteristic of protoplasm enables simple organisms to respond to stimuli? \_\_\_\_\_
2. What is needed for quicker, more complex reactions? \_\_\_\_\_
3. What animal has the most complex nervous system? \_\_\_\_\_
4. Name the parts of man's central nervous system. \_\_\_\_\_  
\_\_\_\_\_
5. What part handles "intelligent" behavior? \_\_\_\_\_
6. When a frog's central nervous system is made the size of a man's, what is their chief difference? \_\_\_\_\_
7. The brain of what type of person gives further proof that a large cerebrum is necessary for intelligence? \_\_\_\_\_
8. Are any parts of our nervous system unnecessary? \_\_\_\_\_
9. How many nerve cells (neurons) make up man's central nervous system? \_\_\_\_\_  
\_\_\_\_\_
10. What is the usual shape of a nerve cell? \_\_\_\_\_
11. Is a nerve insulated? \_\_\_\_\_
12. Are motor nerves in front or in back of the spinal cord? \_\_\_\_\_
13. Where are sensory nerves located? \_\_\_\_\_
14. How fast does the nerve impulse travel? \_\_\_\_\_
15. Name three changes which are the nerve impulse. \_\_\_\_\_
16. How quickly does a nerve recover from carrying an impulse? \_\_\_\_\_
17. What proof does the electrical part of the nerve impulse give us that the brain of a person at rest is active? \_\_\_\_\_
18. Can an animal make simple responses without a brain? \_\_\_\_\_
19. Do you think a person can think without a brain? \_\_\_\_\_





Sum up your findings on the back of this paper, under these headings:

1. Need for a nervous system in man.
2. Structure and function of man's central nervous system.
3. Nerve structure, types, and connections.
4. Nerve impulse.
5. Intelligence.

#### Final Test on Behavior

The final test was identical with the pre-test (see pages 24 to 29).

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## CHAPTER III

### PROCEDURE IN TEACHING THE UNIT ON BEHAVIOR

#### Orientation of the Unit in the Biology Course

Previous experience with the unit.-- The unit on behavior (originally called a unit on adaptation), was first taught as the tenth of 14 units, then as the ninth of ten units. The disadvantages of coming at or near the end of the year seemed to outweigh the advantages.

Place in a biology course suggested by a review of recent textbooks.-- A study of the textbooks in Appendix A will show that physiology and classification were studied before behavior in all cases, although there was not agreement on what other subject matter should precede a study of behavior.

Place of the unit in the biology course during 1941-42.-- Using previous experience and the study of textbooks as a basis, the unit sequence in the biology course during 1941-42 was as follows: classification and fall nature study, plant and animal physiology, human physiology exclusive of the nervous system, behavior, health and disease, interdependence and conservation, evolution, reproduction, heredity, spring nature study and hobbies. The unit was begun on Monday, November 17, 1941, and completed on Friday, January 16, 1942, except for receipt of the "Value of the unit to me" statements (item 36), which were collected after marks had closed. The unit thus lasted seven weeks (six full and

THE HISTORY OF THE

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two half weeks) and through two vacations: Thanksgiving and Christmas. This was done to give pupils time to think about the unit, or at least to incubate on it, and to have some of their strongest usual emotional experiences during the unit. The risk of having the study last too long was considered worth the advantages gained.

### Teaching Procedure

Principles of learning accepted as basic.-- Good teaching is an art. Knowledge of the many facts that are known about this art does not necessarily make a person a good teacher, but it helps. The author believes that the following ideas have been of value to him in planning and teaching.

1. Pupils are by nature dynamic, plastic, vary in their ability to respond to abstract ideas, and learn by purposeful experience directed toward worthwhile (to the pupil) goals.<sup>1/</sup>
2. Such experience, and the goals when attained, modify the pupil's personality. His personality, therefore, constantly changes.<sup>2/</sup>
3. Goals or drives common to high school pupils are toward recreation, independence, and social approval.<sup>3/</sup>
4. "The mental picture plays a vital part in all phases of education."<sup>4/</sup>

<sup>1/</sup>Roy O. Billett, Fundamentals of Secondary-School Teaching, Houghton Mifflin Company, New York, 1940, pp. 102, 107-109.

<sup>2/</sup>Ibid., p. 109.

<sup>3/</sup>Ibid., p. 108.

<sup>4/</sup>Bertha B. Cobb, Madeline W. Cobb, and Ernest Cobb, The Mind's Eye, The Arlo Publishing Company, Newton Upper Falls, Massachusetts, 1941, p. 46.



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5. The ability to generalize, when thought of as a thought movement rather than as a stated thought product, is found in children from the first grade up.<sup>1/</sup>

6. Difficulty of subject matter depends on the number, complexity, and interrelations of concepts, and not upon the type of subject matter.<sup>2/</sup>

The school and the pupils.--- The school is a four-year New Hampshire high school in a residential and farm town in the south central portion of the state. The enrollment is about 175, with half of the pupils coming by bus from surrounding villages and about a third of these from a district largely composed of mill workers. The building is 15 years old, two stories high, of brick. The laboratory for biology, physics, and chemistry consists of seven 4-pupil wooden tables arranged three, two, and two, with windows on one side of the room and the teacher's bench and blackboard at the other. A third side of the laboratory includes a built-in closet for chemical supplies, doorway, and shelves, built this year, for display purposes and on which the books and other reference materials were placed during the unit. The fourth wall is blank, and close to the benches.

Twenty-four pupils were in the class when the unit was taught. Four of these were seniors, one a junior, and 19, sophomores. A group of sophomores, mostly girls, has been noticeable in school for doing good work; they are only slightly above average in ability, but know

1/George W. Haupt, An Experimental Application of a Philosophy of Science Teaching in an Elementary School, Bureau of Publications, Teachers College, Columbia University, New York, 1935, p. 100.

2/Ibid., pp. 33, 103.

the first of the two main parts of the work, the first part is devoted to the study of the history of the language, and the second part to the study of the grammar of the language.

The first part of the work is devoted to the study of the history of the language, and the second part to the study of the grammar of the language. The first part is divided into two main parts, the first of which is devoted to the study of the history of the language, and the second part to the study of the grammar of the language.

The second part of the work is devoted to the study of the grammar of the language, and is divided into two main parts, the first of which is devoted to the study of the grammar of the language, and the second part to the study of the grammar of the language.

The third part of the work is devoted to the study of the grammar of the language, and is divided into two main parts, the first of which is devoted to the study of the grammar of the language, and the second part to the study of the grammar of the language.

The fourth part of the work is devoted to the study of the grammar of the language, and is divided into two main parts, the first of which is devoted to the study of the grammar of the language, and the second part to the study of the grammar of the language.

The fifth part of the work is devoted to the study of the grammar of the language, and is divided into two main parts, the first of which is devoted to the study of the grammar of the language, and the second part to the study of the grammar of the language.

The sixth part of the work is devoted to the study of the grammar of the language, and is divided into two main parts, the first of which is devoted to the study of the grammar of the language, and the second part to the study of the grammar of the language.

The seventh part of the work is devoted to the study of the grammar of the language, and is divided into two main parts, the first of which is devoted to the study of the grammar of the language, and the second part to the study of the grammar of the language.

The eighth part of the work is devoted to the study of the grammar of the language, and is divided into two main parts, the first of which is devoted to the study of the grammar of the language, and the second part to the study of the grammar of the language.

how to study. The class average in ability was slightly above normal. There were ten boys and fourteen girls.

Biology is taught the first period every day, and the first two on Wednesdays and Fridays. Each period is 40 minutes long. The first period starts at 8:20 A. M.

Introduction of the unit.-- On Monday, November 17th, experiment papers of a previous unit were returned to the class. Then the pre-test papers were passed out, with the explanation that this was to find out what the pupils already knew about behavior, and would not be marked like a test. A chance was given to explain directions. The pre-test lasted from 8:24 to 8:54, or 30 minutes, until most of the pupils were through. They were then collected, film 1 study sheets given out and their purpose explained, and the class went upstairs to the assembly hall, where a photographer, who loaned us his services and sound machine, showed the first film.<sup>1/</sup> After the first showing, questions were asked and discussed, and the film was then shown a second time. We returned to the laboratory,<sup>2/</sup> study and activity guides were given out and their bulk explained to the pupils' relief, and the introduction read silently. White-lined paper was given out for experiment 13, and it was suggested that they should do activity 1 that night.

Through a few remarks as the pre-test, the film, and the study guides were presented, and discussion of the film, an attempt was made

1/The Study of Infant Behavior, Ps6 (Boston University), two reels, sound. Produced by the Yale Clinic of Child Development.

2/Period two was also used for biology, as it was a study period for the class. This was done on one or two other Mondays.





to arouse interest in the unit. The previous week one or two remarks had been made to arouse curiosity and interest in the forthcoming unit, but its nature was not revealed. From observation and subsequent pupil activity it would seem that this motivation was reasonably successful.

A log of the unit procedure.-- Tuesday, November 18: Discussed film 1, and helped pupils who missed a few items on the study notes. Discussed activity 1 and evolved a definition: "Behavior is everything that a living thing does." Gave out paper for activities. Began lecture 1, on tropisms.<sup>1/</sup>

Wednesday, November 18: Finished lecture 1, on tropisms. Explained references, optional activities, and asked for clippings. Gave time for individual and group activity, study, examination of references. Gave quiz 1, on tropisms, and discussed it. Began lecture 2, on hormones.

Thursday, November 20: Finished lecture 2, on hormones. Discussed hormones. Gave paper for plant report, item 5.

Friday, November 21: Discussed hormones. Time for special, individual work. Quiz 2, on hormones. Gave out study notes for film 2.

Monday, November 24: Showed film 2, The Nervous System,<sup>2/</sup> three times, with discussions between showings.

Tuesday, November 25: Reviewed film notes. Began lecture 3, The Nervous System. Gave out paper for item 6.

Wednesday, November 26: Finished lecture on nervous system. Discussed nervous system. Gave out paper for items 8 and 9.

1/For all teacher lectures and quizzes, see Appendix B.

2/The Nervous System, B24 (Boston University), one reel, sound, 1938, Erpi Classroom Films, Inc., New York.



Monday, December 1: Quiz 3, The Nervous System. Did experiment 14 (item 8) on reaction time.

Tuesday, December 2: Did experiment 15 (item 9) on the patellar reflex. Began lecture 4, Types of Behavior.

Wednesday, December 3: Finished lecture 4. Gave out paper for items 10, 11, and 12.

Thursday, December 4: Gave out paper for item 13. Asked for materials for experiment 16. Told story of "Low Bridge."<sup>1/</sup> Discussed story. Discussed whether or not simple habit would stick better than complex. Class about evenly divided. Got into discussion of memory. Discussed types of behavior. Class has trouble seeing difference between conditioned reflex and habit.

Friday, December 5: Did experiment 16 (item 10). Re-lectured on the nervous system.

Monday, December 8: Gave nervous system quiz over again. Discussed types of behavior. Gave paper for items 14, 16, 17, and 18.

Tuesday, December 9: Gave quiz 4, Types of Behavior. Gave paper for item 19.

Wednesday, December 10: Gave out paper for lectures. Gave lecture 5, The Sense of Smell. Gave lecture 6, The Ear, making diagram as we went along. Gave out paper for item 21.

Thursday, December 11: Gave out paper for lecture. Gave lecture 7, The Eye, making diagram as we went along.

Friday, December 12: Gave out paper for items 23, 24, 25, and 26.

1/See Appendix B.

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Did experiments 22 and 23 (items 23 and 24). Discussion on vision.

Monday, December 15: Discussed eye experiments and sense organs.

Tuesday, December 16: Quiz 5, Sense Organs. Gave out paper for items 28, 29, and lecture.

Wednesday, December 17: Discussed the advantages and disadvantages of instinctive and intelligent behavior, activity 42. Did experiment 26 (item 28).

Thursday, December 18: Summed up discussion on instinctive and intelligent behavior. Tried experiment 27 (item 29).

Friday, December 19: Gave lecture 8, Ways of Learning. Tried experiment 27 again. Gave out paper for items 30, 31, and 32. Discussed activities 46, 48, 49, 50, 51, and 52.

Monday, December 22: Did experiment 27 successfully. Discussed activities 47 and 48 still further.

Tuesday, December 23: Discussed activity 49, Can human behavior be changed?

Monday, January 5: Reviewed activities 46 to 50. Discussed activity 51. Discussed bringing in clippings, clippings already brought in, Reader's Digest article in December issue, "Human Nature Has Changed."

Tuesday, January 6: Discussed clippings. Discussed activity 51, on emotions. Gave out paper for item 33.

Wednesday, January 7: Discussed activities 51 and 52.

Thursday, January 8: Discussed activity 53, happiness, change, and related problems. Began with the "unhappy" period in The Story of a Bad Boy and added experiences of members of the class.





Friday, January 9: Discussed activities 51 to 54. Class response was good. After class, request was made for a discussion, "bull session" type, voodoo session, and a dramatic incident.

Monday, January 12: Gave quiz 6, Controlling Behavior. Discussed quiz. Discussed activity 56, on unsolved behavior problems, briefly.

Tuesday, January 13: Dramatic stunt.<sup>1/</sup> Class write-up. Continued discussion of unsolved behavior problem of hypnotism, using Life clippings.

Wednesday, January 14: Continued discussion of hypnotism, using Life clippings and Esquire article. Began discussion of spiritualism. Also discussed "Get Mad" article.

Thursday, January 15: Finished discussion of spiritualism, using Life clippings.

Friday, January 16: Final test on the unit, 8:36-9:06 A. M., or 30 minutes, same as the pre-test. Discussed rest of unsolved behavior problems. Discussed final test and the unit. Asked pupils to do item 36 and gave out paper. (These were not collected until after marks were out.)

Summary of unit procedure.-- Interest in the unit on behavior was aroused by a few casual references to the "next unit" the week before to excite curiosity, by giving the pre-test, the moving picture on the behavior of young children, and a few comments when the study and activity guide was distributed.

The required, minimum activities were planned both to provide a variety of pupil activities and to ensure steady progress in mastery of

1/See Appendix C.

THE UNIVERSITY OF CHICAGO  
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DEPARTMENT OF CHEMISTRY

REPORT OF THE  
COMMISSIONER OF THE  
BUREAU OF CHEMISTRY

FOR THE YEAR  
ENDING 1900

CHICAGO  
1901

THE UNIVERSITY OF CHICAGO  
DIVISION OF THE PHYSICAL SCIENCES  
DEPARTMENT OF CHEMISTRY

REPORT OF THE  
COMMISSIONER OF THE  
BUREAU OF CHEMISTRY

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1901

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DIVISION OF THE PHYSICAL SCIENCES  
DEPARTMENT OF CHEMISTRY

the unit. Thirty-five <sup>1/</sup> of the 60 activities were to be written items. Of these, six were quizzes, fifteen were experiments, three were diagrams, one was a reference report, eight were reports drawing on the pupil's background and/or what he learned during the unit, one was the final test, and one was the pupil's evaluation of the unit. The remaining 25 activities included eight teacher lectures and one moving picture, on which (and the first moving picture) pupils were to take notes but the notes need not be passed in, thirteen discussions, special reports, and two outside assignments (activities 1 and 28). Thus eight activities were testing activities, eight (the lectures) placed emphasis on the teacher, two were moving pictures, and 44 were primarily pupil activities, divided fairly evenly between experimenting, discussing, and reporting. Experiments were divided into three parts: statement of purpose, diagrams, and conclusion. All written papers had the pupil's name, subject, and date in the upper right-hand corner, which was standard practice throughout the school.

Some time was given, even when not so recorded in the log of the unit procedure, for individual pupil work, including work on the optional, related activities, but less than had been planned.

Nearly half of the class began one or more of the optional activities, and approximately 20 per cent finished one or more of these activities.

The 91 references listed in the study and activity guide were

1/Thirty-six items are numbered, but No. 1, the pre-test, is not included in the 60 activities in the study and activity guide for psychological reasons. It, together with the first moving picture, makes an actual total of 62 activities.





chosen from a longer list during the summer and fall of 1941 after evolving, through research and the help of Dr. Hanson's summer session class in "Methods of Educational Research," criteria for selecting reference books. Twenty-five students evaluated a set of 24 criteria, resulting in a revision of criteria as follows.

Criteria for Selection of Reference Books in Tenth Grade Biology

1. Words, in general, in Thorndike's <sup>1/</sup>10,000 list; technical terms in Curtis' <sup>2/</sup>biology list.
2. Type easy to read: capitals 3/16 inches or more high.
3. Material pertinent to biology, and suited to community where used.
4. Well supplied with interesting, pertinent visual aids: charts, photographs, diagrams, etc.
5. Organized to present main ideas clearly, show their relationships, and not blur them by irrelevant or excessive detail.
6. Reliable: qualified author, material up-to-date and accurate.
7. Interesting style, stimulating pupils to think.
8. Practical: suggests activities, gives good bibliography, easy to locate answers to questions (clear-cut table of contents, index, glossary).
9. Successful: pupils like the book. (After use.)

1/Edward L. Thorndike, The Teacher's Word Book, Teachers College, Columbia University, New York, 1921, vi + 134.

2/Francis D. Curtis, Investigations of Vocabulary in Textbooks of Science for Secondary Schools, Ginn and Company, New York, 1938, pp. 94-110.

The first part of the report deals with the general situation of the country and the progress of the work during the year. It is followed by a detailed account of the various projects and the results achieved. The report concludes with a summary of the work done and the plans for the future.

The second part of the report deals with the financial aspects of the work. It gives a detailed account of the income and expenditure of the organization and shows how the funds have been used. It also includes a statement of the assets and liabilities of the organization.

The third part of the report deals with the administrative aspects of the work. It gives a detailed account of the organization of the work and the methods used to carry it out. It also includes a statement of the personnel of the organization and a list of the names of the members of the organization.

The fourth part of the report deals with the future of the organization. It gives a detailed account of the plans for the future and the steps that will be taken to carry them out. It also includes a statement of the hopes and aspirations of the members of the organization.

### Additional Criteria for Teacher References

10. Facts and ideas beyond what is to be taught, giving the teacher a rich background for the subject. (Words and style may be more advanced than in general references.)

11. Tells of unsolved problems in the field.

12. Presents teaching methods applicable to the subject.

13. Contains suggestions for equipment: apparatus, supplies, visual aids.

No one book is expected to meet all these criteria. Probably criterion 3 should always be met, and a majority met to make considerable use of the book. These criteria may be sharpened in selecting books for any particular unit or topic.

Using these criteria, sharpened to the viewpoint of the unit on behavior, references that did not seem to satisfy a majority of the first eight criteria were thrown out; 91 were retained (pages 42 to 45).

Eight additional references were discovered and suggested during the unit. Most of them were published after the unit was begun. One of them (Ruch, People Are Important) was borrowed by one of the pupils for the rest of the school year.

### Results from the Teaching of the Unit

Test results.-- In 1940-41, no pre-test was given. The final test, given June 9, 1941, consisted of 70 items: 55 multiple (5) choice, 13 multiple (3) choice, one problem situation, and one diagram. This test is reproduced in Appendix D. On the basis both of the number of pupils

THE HISTORY OF THE UNITED STATES

FROM THE FIRST SETTLEMENTS TO THE PRESENT TIME

BY J. H. HARRIS

IN TWO VOLUMES

VOLUME I

NEW YORK: PUBLISHED BY J. H. HARRIS

1850

THE HISTORY OF THE UNITED STATES, FROM THE FIRST SETTLEMENTS TO THE PRESENT TIME, BY J. H. HARRIS, IN TWO VOLUMES. VOLUME I.

NEW YORK: PUBLISHED BY J. H. HARRIS, 1850.

THE HISTORY OF THE UNITED STATES, FROM THE FIRST SETTLEMENTS TO THE PRESENT TIME, BY J. H. HARRIS, IN TWO VOLUMES. VOLUME I.

NEW YORK: PUBLISHED BY J. H. HARRIS, 1850.

THE HISTORY OF THE UNITED STATES, FROM THE FIRST SETTLEMENTS TO THE PRESENT TIME, BY J. H. HARRIS, IN TWO VOLUMES. VOLUME I.

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THE HISTORY OF THE UNITED STATES, FROM THE FIRST SETTLEMENTS TO THE PRESENT TIME, BY J. H. HARRIS, IN TWO VOLUMES. VOLUME I.

who missed the question, and its relevancy to the unit after its last revision during the summer of 1941, items 1, 2, 3, 5, 21, 22, 34, 35, 36, 37, 40, 46, 59, 60, and 62 were dropped from the test, and two new items were added, giving the new test a total of 57 items: 45 multiple (5) choice, 10 multiple (3) choice, one problem situation, and one diagram. This test in Chapter II, pages 24 to 29, and in Chapter III, Table 4.

The new order of items, following the last revision of the unit, may be compared with the previous order by giving the numbers of the 1940-41 test items as they occur in the present test: 41, 42, 14, 13, 39, 38, 28, 17, 20, 19, 23, 16, 8, 15, 18, 43, 9, 10, 11, 12, 26, 44, 45, 24, 25, 27, 29, 30, 31, 32, 33, 47, 49, 50, 51, 48, new item, new item, 6, 7, 52, 53, 4, 54, 55, 57, 58, 61, 63, 54, 65, 66, 69, 68, 67, 56, and 70.

Choices that were not used were removed as being either too easy or too difficult; they might of course not have been used by chance, as a relatively small group of pupils took the test. New choices were substituted for those removed. A few new choices were inserted even though the old ones had drawn a response (items 1, 17). Whether they are better is not easy to determine, since effective teaching should eliminate all wrong answers, and the group was small. The pre-test may be the best place to judge since no instruction had been given. A summary of the changes and the results is given in Table 2.

Table 2 shows that of 50 choices changed, 16 were not used in the pre-test, and 34 were used. This suggests that the changes made were





Table 2. Test Choices Not Used by Pupils in the Test As Given in 1940-41, and Results on New Choices Substituted in the Test As Given in 1941-42.

Item	Choice	No. Using Choice		Item	Choice	No. Using Choice	
		Pre-Test	Final			Pre-Test	Final
(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
1*	2**	0	0	21	5	0	0
	5***	1	0	22	2	1	2
2	1	0	0	24	2	3	0
	3	2	4		5	4	6
3	3	3	0	26	2	3	3
	5	3	0	27	4	0	1
4	1	3	0	28	3	0	0
	4	5	0		5	0	1
5	2	5	0	30	5	3	0
8	3	4	1	31	5	2	0
	4	1	0	32	3	8	3
9	2	2	0		4	0	1
10	1	5	1		5	5	9
	3	6	2	33	1	8	3
11	2	0	0		3	0	0
12	4	4	1		5	6	6
	5	3	0	34	1	2	3
16	1	2	4	35	1	12	9
17	2	0	0		4	0	0
	5	0	0	36	3	2	1
18	4	0	5	41	3	0	3
	5	8	1	44	1	6	1
19	5	0	3		2	2	1
21	3	0	1		4	2	2
	4	1	0	45	3	11	4

\* Item numbers are as arranged in new pre-test and test.

\*\* Changed although one pupil used it in old test.

\*\*\* Changed although two pupils used it in old test.

as a whole successful. Seven of the choices not used in the pre-test were chosen in the final test, six were chosen by more pupils in the final test, and three remained unchanged. This suggests either that the unit on behavior had the effect of confusing some pupils regarding

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 THE DIVISION OF THE PHYSICAL SCIENCES  
 DEPARTMENT OF CHEMISTRY  
 LABORATORY OF PHYSICAL CHEMISTRY  
 CHICAGO, ILL.

Date	Time	Temperature	Pressure	Volume	Weight	Density	Remarks
1911	10:30	20.0	760.0	1.000	1.000	1.000	Normal
1911	11:00	20.5	760.5	1.005	1.005	1.005	Normal
1911	11:30	21.0	761.0	1.010	1.010	1.010	Normal
1911	12:00	21.5	761.5	1.015	1.015	1.015	Normal
1911	12:30	22.0	762.0	1.020	1.020	1.020	Normal
1911	13:00	22.5	762.5	1.025	1.025	1.025	Normal
1911	13:30	23.0	763.0	1.030	1.030	1.030	Normal
1911	14:00	23.5	763.5	1.035	1.035	1.035	Normal
1911	14:30	24.0	764.0	1.040	1.040	1.040	Normal
1911	15:00	24.5	764.5	1.045	1.045	1.045	Normal
1911	15:30	25.0	765.0	1.050	1.050	1.050	Normal
1911	16:00	25.5	765.5	1.055	1.055	1.055	Normal
1911	16:30	26.0	766.0	1.060	1.060	1.060	Normal
1911	17:00	26.5	766.5	1.065	1.065	1.065	Normal
1911	17:30	27.0	767.0	1.070	1.070	1.070	Normal
1911	18:00	27.5	767.5	1.075	1.075	1.075	Normal
1911	18:30	28.0	768.0	1.080	1.080	1.080	Normal
1911	19:00	28.5	768.5	1.085	1.085	1.085	Normal
1911	19:30	29.0	769.0	1.090	1.090	1.090	Normal
1911	20:00	29.5	769.5	1.095	1.095	1.095	Normal
1911	20:30	30.0	770.0	1.100	1.100	1.100	Normal
1911	21:00	30.5	770.5	1.105	1.105	1.105	Normal
1911	21:30	31.0	771.0	1.110	1.110	1.110	Normal
1911	22:00	31.5	771.5	1.115	1.115	1.115	Normal
1911	22:30	32.0	772.0	1.120	1.120	1.120	Normal
1911	23:00	32.5	772.5	1.125	1.125	1.125	Normal
1911	23:30	33.0	773.0	1.130	1.130	1.130	Normal
1911	00:00	33.5	773.5	1.135	1.135	1.135	Normal
1911	00:30	34.0	774.0	1.140	1.140	1.140	Normal
1911	01:00	34.5	774.5	1.145	1.145	1.145	Normal
1911	01:30	35.0	775.0	1.150	1.150	1.150	Normal
1911	02:00	35.5	775.5	1.155	1.155	1.155	Normal
1911	02:30	36.0	776.0	1.160	1.160	1.160	Normal
1911	03:00	36.5	776.5	1.165	1.165	1.165	Normal
1911	03:30	37.0	777.0	1.170	1.170	1.170	Normal
1911	04:00	37.5	777.5	1.175	1.175	1.175	Normal
1911	04:30	38.0	778.0	1.180	1.180	1.180	Normal
1911	05:00	38.5	778.5	1.185	1.185	1.185	Normal
1911	05:30	39.0	779.0	1.190	1.190	1.190	Normal
1911	06:00	39.5	779.5	1.195	1.195	1.195	Normal
1911	06:30	40.0	780.0	1.200	1.200	1.200	Normal
1911	07:00	40.5	780.5	1.205	1.205	1.205	Normal
1911	07:30	41.0	781.0	1.210	1.210	1.210	Normal
1911	08:00	41.5	781.5	1.215	1.215	1.215	Normal
1911	08:30	42.0	782.0	1.220	1.220	1.220	Normal
1911	09:00	42.5	782.5	1.225	1.225	1.225	Normal
1911	09:30	43.0	783.0	1.230	1.230	1.230	Normal
1911	10:00	43.5	783.5	1.235	1.235	1.235	Normal
1911	10:30	44.0	784.0	1.240	1.240	1.240	Normal
1911	11:00	44.5	784.5	1.245	1.245	1.245	Normal
1911	11:30	45.0	785.0	1.250	1.250	1.250	Normal
1911	12:00	45.5	785.5	1.255	1.255	1.255	Normal
1911	12:30	46.0	786.0	1.260	1.260	1.260	Normal
1911	13:00	46.5	786.5	1.265	1.265	1.265	Normal
1911	13:30	47.0	787.0	1.270	1.270	1.270	Normal
1911	14:00	47.5	787.5	1.275	1.275	1.275	Normal
1911	14:30	48.0	788.0	1.280	1.280	1.280	Normal
1911	15:00	48.5	788.5	1.285	1.285	1.285	Normal
1911	15:30	49.0	789.0	1.290	1.290	1.290	Normal
1911	16:00	49.5	789.5	1.295	1.295	1.295	Normal
1911	16:30	50.0	790.0	1.300	1.300	1.300	Normal
1911	17:00	50.5	790.5	1.305	1.305	1.305	Normal
1911	17:30	51.0	791.0	1.310	1.310	1.310	Normal
1911	18:00	51.5	791.5	1.315	1.315	1.315	Normal
1911	18:30	52.0	792.0	1.320	1.320	1.320	Normal
1911	19:00	52.5	792.5	1.325	1.325	1.325	Normal
1911	19:30	53.0	793.0	1.330	1.330	1.330	Normal
1911	20:00	53.5	793.5	1.335	1.335	1.335	Normal
1911	20:30	54.0	794.0	1.340	1.340	1.340	Normal
1911	21:00	54.5	794.5	1.345	1.345	1.345	Normal
1911	21:30	55.0	795.0	1.350	1.350	1.350	Normal
1911	22:00	55.5	795.5	1.355	1.355	1.355	Normal
1911	22:30	56.0	796.0	1.360	1.360	1.360	Normal
1911	23:00	56.5	796.5	1.365	1.365	1.365	Normal
1911	23:30	57.0	797.0	1.370	1.370	1.370	Normal
1911	00:00	57.5	797.5	1.375	1.375	1.375	Normal
1911	00:30	58.0	798.0	1.380	1.380	1.380	Normal
1911	01:00	58.5	798.5	1.385	1.385	1.385	Normal
1911	01:30	59.0	799.0	1.390	1.390	1.390	Normal
1911	02:00	59.5	799.5	1.395	1.395	1.395	Normal
1911	02:30	60.0	800.0	1.400	1.400	1.400	Normal
1911	03:00	60.5	800.5	1.405	1.405	1.405	Normal
1911	03:30	61.0	801.0	1.410	1.410	1.410	Normal
1911	04:00	61.5	801.5	1.415	1.415	1.415	Normal
1911	04:30	62.0	802.0	1.420	1.420	1.420	Normal
1911	05:00	62.5	802.5	1.425	1.425	1.425	Normal
1911	05:30	63.0	803.0	1.430	1.430	1.430	Normal
1911	06:00	63.5	803.5	1.435	1.435	1.435	Normal
1911	06:30	64.0	804.0	1.440	1.440	1.440	Normal
1911	07:00	64.5	804.5	1.445	1.445	1.445	Normal
1911	07:30	65.0	805.0	1.450	1.450	1.450	Normal
1911	08:00	65.5	805.5	1.455	1.455	1.455	Normal
1911	08:30	66.0	806.0	1.460	1.460	1.460	Normal
1911	09:00	66.5	806.5	1.465	1.465	1.465	Normal
1911	09:30	67.0	807.0	1.470	1.470	1.470	Normal
1911	10:00	67.5	807.5	1.475	1.475	1.475	Normal
1911	10:30	68.0	808.0	1.480	1.480	1.480	Normal
1911	11:00	68.5	808.5	1.485	1.485	1.485	Normal
1911	11:30	69.0	809.0	1.490	1.490	1.490	Normal
1911	12:00	69.5	809.5	1.495	1.495	1.495	Normal
1911	12:30	70.0	810.0	1.500	1.500	1.500	Normal
1911	13:00	70.5	810.5	1.505	1.505	1.505	Normal
1911	13:30	71.0	811.0	1.510	1.510	1.510	Normal
1911	14:00	71.5	811.5	1.515	1.515	1.515	Normal
1911	14:30	72.0	812.0	1.520	1.520	1.520	Normal
1911	15:00	72.5	812.5	1.525	1.525	1.525	Normal
1911	15:30	73.0	813.0	1.530	1.530	1.530	Normal
1911	16:00	73.5	813.5	1.535	1.535	1.535	Normal
1911	16:30	74.0	814.0	1.540	1.540	1.540	Normal
1911	17:00	74.5	814.5	1.545	1.545	1.545	Normal
1911	17:30	75.0	815.0	1.550	1.550	1.550	Normal
1911	18:00	75.5	815.5	1.555	1.555	1.555	Normal
1911	18:30	76.0	816.0	1.560	1.560	1.560	Normal
1911	19:00	76.5	816.5	1.565	1.565	1.565	Normal
1911	19:30	77.0	817.0	1.570	1.570	1.570	Normal
1911	20:00	77.5	817.5	1.575	1.575	1.575	Normal
1911	20:30	78.0	818.0	1.580	1.580	1.580	Normal
1911	21:00	78.5	818.5	1.585	1.585	1.585	Normal
1911	21:30	79.0	819.0	1.590	1.590	1.590	Normal
1911	22:00	79.5	819.5	1.595	1.595	1.595	Normal
1911	22:30	80.0	820.0	1.600	1.600	1.600	Normal
1911	23:00	80.5	820.5	1.605	1.605	1.605	Normal
1911	23:30	81.0	821.0	1.610	1.610	1.610	Normal
1911	00:00	81.5	821.5	1.615	1.615	1.615	Normal
1911	00:30	82.0	822.0	1.620	1.620	1.620	Normal
1911	01:00	82.5	822.5	1.625	1.625	1.625	Normal
1911	01:30	83.0	823.0	1.630	1.630	1.630	Normal
1911	02:00	83.5	823.5	1.635	1.635	1.635	Normal
1911	02:30	84.0	824.0	1.640	1.640	1.640	Normal
1911	03:00	84.5	824.5	1.645	1.645	1.645	Normal
1911	03:30	85.0	825.0	1.650	1.650	1.650	Normal
1911	04:00	85.5	825.5	1.655	1.655	1.655	Normal
1911	04:30	86.0	826.0	1.660	1.660	1.660	Normal
1911	05:00	86.5	826.5	1.665	1.665	1.665	Normal
1911	05:30	87.0	827.0	1.670	1.670	1.670	Normal
1911	06:00	87.5	827.5	1.675	1.675	1.675	Normal
1911	06:30	88.0	828.0	1.680	1.680	1.680	Normal
1911	07:00	88.5	828.5	1.685	1.685	1.685	Normal
1911	07:30	89.0	829.0	1.690	1.690	1.690	Normal
1911	08:00	89.5	829.5	1.695	1.695	1.695	Normal
1911	08:30	90.0	830.0	1.700	1.700	1.700	Normal
1911	09:00	90.5	830.5	1.705	1.705	1.705	Normal
1911	09:30	91.0	831.0	1.710	1.710	1.710	Normal
1911	10:00	91.5	831.5	1.715	1.715	1.715	Normal
1911	10:30	92.0	832.0	1.720	1.720	1.720	Normal
1911	11:00	92.5	832.5	1.725	1.725	1.725	Normal
1911	11:30	93.0	833.0	1.730	1.730	1.730	Normal
1911	12:00	93.5	833.5	1.735	1.735	1.735	Normal
1911	12:30	94.0	834.0	1.740	1.740	1.740	Normal
1911	13:00	94.5	834.5	1.745	1.745	1.745	Normal
1911	13:30	95.					

some details, or perhaps that, knowing more about the subject, pupils saw arguments for certain choices of which they originally were not aware. In one or two cases the change may have been due to lack of preparation and guessing. Thirteen choices used in the pre-test were not used in the final test, and 12 choices used in the pre-test were chosen by fewer pupils in the final test, suggesting that learning was effective.

Test choices used last year, but not used by pupils in the new pre-test or final test are listed in Table 3.

A study of Table 3 reveals 30 choices not used on the pre-test, four of which were the correct answer. All four were used in the final test. Nineteen of the remaining 26 were used by less than four pupils in the old test, and two did not occur in the old test. These 21 it would seem should be changed another year. Outside of correct answers, 14 of these 21 choices were used in the final test, but only four by more than two pupils. As with Table 2, this suggests either that the unit on behavior had the effect of confusing some pupils regarding some details, or perhaps that, knowing more about the subject, pupils saw arguments for choices of which they originally were not aware. Here again, a few changes were probably due to guessing. Thirty-two choices used in the pre-test were not used in the final test, suggesting that learning was effective.

Summing up the results shown in Tables 2 and 3, there are 37 choices out of a total of 255 that may need further revision; 45 choices used in the pre-test but not used in the final test, four correct choices not





Table 3. Test Choices Not Used in the Test As Given in 1941-42, But Used in the Test As Given in 1940-41.

Item	Choice	No. Using Choice		
		Pre-Test	Final	Old Test
(1)	(2)	(3)	(4)	(5)
1*	1	6	0	3
	3(2)	0	0	0 (Not changed due to
2	2	0	0	1 an error)
	5	9	0	6
3	4	2	0	6
4	2**	0	23	32
	3	10	0	3
	5	5	0	1
5	5	2	0	6
6	4	0	4	2
7	1	3	0	3
	3	1	0	1
	5	7	0	13
9	1	0	2	4
11	4	0	1	8
12	1	0	3	12
	2**	0	11	17
13	4**	0	14	2
15	4	0	4	- (No choice 4 due to
16	4	0	0	3 an error)
	5	0	1	1
17	1	3	0	3
	4	1	0	2
18	3	0	0	1
20	1	1	0	3
	3	3	0	1
21	2**	0	14	11
22	4	0	0	6
23	4	1	0	1
	5	1	0	1
24	1	3	0	4
	4	1	0	4
25	2	0	1	2
26	3	1	0	1
27	2	0	4	2
	5	0	0	1

\* Item numbers are as arranged in new pre-test and test.

\*\*Correct answer.



Table 3. (concluded)

Item	Choice	No. Using Choice		
		Pre-Test	Final	Old Test
(1)	(2)	(3)	(4)	(5)
28*	4	1	0	1
29	1	0	1	5
	3	1	0	7
	5	0	0	5
30	1	1	0	1
	3	4	0	2
	4	0	0	1
31	4	0	0	3
32	2	0	1	1
33	2	0	0	1
34	3	1	0	1
35	3	0	1	2
37	1	2	0	- (New item)
	2	3	0	- ( " )
	4	4	0	- ( " )
38	3	0	0	- ( " )
40	5	3	0	2
41	2	0	1	2
	4	1	0	1
	5	0	2	2
42	3	1	0	2
	5	11	0	16
43	2	4	0	4
45	1	0	1	1
	4	0	0	1
46	C	1	0	5

\* Item numbers are as arranged in new pre-test and test.

\*\*Correct answer.

used in the pre-test but used in the final test, and 12 choices used by fewer pupils in the final test suggest effective learning; 20 wrong choices were used by more pupils in the final test than in the pre-test, but only nine of these by more than two pupils.

Table 4 presents the crucial data on the major evaluation of the

Section 1				Section 2	
Item		Description		Amount	
100		1000		1000	
101		1000		1000	
102		1000		1000	
103		1000		1000	
104		1000		1000	
105		1000		1000	
106		1000		1000	
107		1000		1000	
108		1000		1000	
109		1000		1000	
110		1000		1000	
111		1000		1000	
112		1000		1000	
113		1000		1000	
114		1000		1000	
115		1000		1000	
116		1000		1000	
117		1000		1000	
118		1000		1000	
119		1000		1000	
120		1000		1000	
121		1000		1000	
122		1000		1000	
123		1000		1000	
124		1000		1000	
125		1000		1000	
126		1000		1000	
127		1000		1000	
128		1000		1000	
129		1000		1000	
130		1000		1000	
131		1000		1000	
132		1000		1000	
133		1000		1000	
134		1000		1000	
135		1000		1000	
136		1000		1000	
137		1000		1000	
138		1000		1000	
139		1000		1000	
140		1000		1000	
141		1000		1000	
142		1000		1000	
143		1000		1000	
144		1000		1000	
145		1000		1000	
146		1000		1000	
147		1000		1000	
148		1000		1000	
149		1000		1000	
150		1000		1000	

...

unit on behavior: results of the pre-test and final test. Pupils had no inkling that the final test would be the same as the pre-test. The pre-test papers were never returned to them for discussion. The two tests are identically the same, and 30 minutes were allowed each time the test was given. While it is not safe to draw conclusions from testing so small a group, the results should be valid for this particular class.

An examination of the table brings out the following facts.

Items confused: 3, 16, 27, 32, 34, 38, 41, 48. Total, 8.

Items unchanged: 26, 47, 53. Total, 3.

Items improved: 1, 2, 4-15, 17-25, 28-31, 33, 35-37, 39, 40, 42-46, 49-52, 54-57. Total, 46.

A more detailed study of these items seems worthwhile.

Items confused. No. 3. Both on the pre-test and final test, most of the class thought that nerves are the physical basis of behavior. This preconceived notion was reinforced by the emphasis on a nervous system in animals. Pupils may well have found the question ambiguous, and interpreted it to refer to man rather than to all living things. The concept of protoplasm as the physical basis of behavior was mentioned but not emphasized.

No. 16. Perhaps it is not correct to say that the class was confused on this point. Almost all of the class had it right, and the decrease was slight.

No. 27. Emphasis was laid upon the correct answer to this item, but the alternative choices were factors in the class discussion, and



The first of these is the fact that the  
the second is the fact that the  
the third is the fact that the  
the fourth is the fact that the  
the fifth is the fact that the

The sixth is the fact that the  
the seventh is the fact that the  
the eighth is the fact that the  
the ninth is the fact that the  
the tenth is the fact that the

The eleventh is the fact that the  
the twelfth is the fact that the  
the thirteenth is the fact that the  
the fourteenth is the fact that the  
the fifteenth is the fact that the

The sixteenth is the fact that the  
the seventeenth is the fact that the  
the eighteenth is the fact that the  
the nineteenth is the fact that the  
the twentieth is the fact that the

The twenty-first is the fact that the  
the twenty-second is the fact that the  
the twenty-third is the fact that the  
the twenty-fourth is the fact that the  
the twenty-fifth is the fact that the

Table 4. Summary and Analysis of Results of the Pre-Test and Final Test, 1941-42.

Test Item	Choice Number									
	1		2		3		4		5	
	P	F	P	F	P	F	P	F	P	F
1. Everything that a living thing does is called: 1--Activity; 2--movement; 3--living; 4--behavior; 5--response.	6	0	0	0	0	0	17*23*		1	0
2. Anything which may produce a response is called: 1--Substance; 2--matter; 3--alive; 4--stimulus; 5--reaction.	0	0	0	0	2	4	13*19*		9	0
3. The physical basis of behavior is: 1--Nerves; 2--protoplasm; 3--coordination; 4--responsiveness; 5--chemical reactions.	12	21	3*	2*	3	0	2	0	3	0
4. Turning toward or away from light, heat, water, contact, gravity, and chemicals is called: 1--Irritability; 2--a tropism; 3--reaction; 4--a reflex; 5--sensitivity.	3	0	0*23*		10	0	5	0	5	0
5. The type of chemical made in the ductless glands and elsewhere in the body, which plays an important role in our behavior, is: 1--Hormone; 2--sympathin; 3--auxin; 4--acetic acid; 5--lactic acid.	8*21*		5	0	2	1	5	1	2	0
6. The chemical responsible for our pain sense is: 1--Auxin; 2--hormone; 3--acetic acid; 4--histamine; 5--lactic acid.	5	7	8	8	3	1	0*4*		2	3
7. Man's nervous systems are the type known as: 1--Diversified; 2--ladder; 3--ring; 4--specialized; 5--diffuse.	3	0	3*20*		1	0	8	3	7	0
8. The main parts of the central nervous system are: 1--Brain and spinal cord; 2--cerebrum and cerebellum; 3--nerve cords and plexes; 4--cerebrum and spinal cord; 5--brain, plexes, and spinal cord.	13*17*		2	1	4	1	1	0	4	4

\*Correct answers.



Table 4. (continued)

Test Item	Choice Number									
	1		2		3		4		5	
	P	F	P	F	P	F	P	F	P	F
9. The center of consciousness, memory, and thinking is the: 1--Medulla; 2--spinal cord; 3--midbrain; 4--cerebellum; 5--cerebrum.	0	2	2	0	8	3	6	4	7*14*	
10. The center of balance and muscular coordination is the: 1--Plexes; 2--cerebellum; 3--cerebrum; 4--medulla; 5--semicircular canals.	5	1	4*11*		6	2	5	8	2	1
11. The chief known functions of the automatic nervous system is: 1--Control of daily work of internal organs; 2--control of sleeping; 3--unconscious thought; 4--memory; 5--conditioned reflexes.	6*14*		0	0	3	1	0	1	13	6
12. A nerve impulse is: 1--An electric wave which travels 350 feet per second along a neuron; 2--the electrochemical change which travels along a neuron; 3--the reaction to a stimulus; 4--the desire to do something; 5--the basis of emotions.	0	3	0*11*		17	8	4	1	3	0
13. A reflex action is: 1--A definite response to a definite stimulus; 2--turning toward or away from a stimulus; 3--jerking your hand away from a hot stove; 4--an unlearned, quick, simple response found only in animals; 5--an action that is the reverse of another action.	8	3	6	3	5	3	0*14*		5	0
14. A sensory, associative, and motor neuron make up a: 1--Reflex arc; 2--reflex action; 3--nerve pathway; 4--stimulus-response; 5--neuron.	2*13*		6	2	4	6	4	1	2	1
15. Reflex actions are controlled by the: 1--Brain; 2--automatic nervous system; 3--spinal cord and medulla; 4--brain and spinal cord; 5--cerebellum and medulla.	8	1	13	14	1*	2*	0	4	1	2

\*Correct answers.

Date	Description
1/1/1900	Received from Mr. Smith
1/2/1900	Paid to Mr. Jones
1/3/1900	Received from Mr. Brown
1/4/1900	Paid to Mr. White
1/5/1900	Received from Mr. Green
1/6/1900	Paid to Mr. Black
1/7/1900	Received from Mr. Grey
1/8/1900	Paid to Mr. Blue
1/9/1900	Received from Mr. Yellow
1/10/1900	Paid to Mr. Purple
1/11/1900	Received from Mr. Pink
1/12/1900	Paid to Mr. Orange
1/13/1900	Received from Mr. Red
1/14/1900	Paid to Mr. Green
1/15/1900	Received from Mr. Blue
1/16/1900	Paid to Mr. Yellow
1/17/1900	Received from Mr. Purple
1/18/1900	Paid to Mr. Pink
1/19/1900	Received from Mr. Orange
1/20/1900	Paid to Mr. Red
1/21/1900	Received from Mr. Green
1/22/1900	Paid to Mr. Blue
1/23/1900	Received from Mr. Yellow
1/24/1900	Paid to Mr. Purple
1/25/1900	Received from Mr. Pink
1/26/1900	Paid to Mr. Orange
1/27/1900	Received from Mr. Red
1/28/1900	Paid to Mr. Green
1/29/1900	Received from Mr. Blue
1/30/1900	Paid to Mr. Yellow
1/31/1900	Received from Mr. Purple
2/1/1900	Paid to Mr. Pink
2/2/1900	Received from Mr. Orange
2/3/1900	Paid to Mr. Red
2/4/1900	Received from Mr. Green
2/5/1900	Paid to Mr. Blue
2/6/1900	Received from Mr. Yellow
2/7/1900	Paid to Mr. Purple



Table 4. (continued)

Test Item	Choice Number									
	1		2		3		4		5	
	P	F	P	F	P	F	P	F	P	F
16. The time required to react to a stimulus is called: 1--Response lapse; 2--reaction time; 3--reflex arc; 4--nerve pathway; 5--350 feet per second.	2	4	20*17*		1	1	0	0	0	1
17. A habit is: 1--Something you learn to do; 2--something you should not do; 3--a response usually learned by repetition and done without thinking; 4--a conscious instinct; 5--something you should do.	3	0	0	0	20*23*		1	0	0	0
18. A habit may be formed by: 1--Attempting to do something until you can do it; 2--associating a new stimulus repeatedly with an old one until the act becomes automatic; 3--thinking about something until you know how to do it; 4--trying to do something the wrong way until you prefer the right way; 5--doing a thing several different ways until one way becomes habitual.	6	5	10*12*		0	0	0	5	8	1
19. Aids in forming a habit quickly are: 1--Have someone watch you and guide you in your practice; 2--no exceptions; 3--strong start, no exceptions, interest, make practice opportunities; 4--practice as often and as long as possible; 5--do it the wrong way until the right way is learned.	3	2	1	2	9*14*		11	2	0	3
20. The best way to break a "bad" habit is: 1--Stop it completely; 2--be too busy to find time for it; 3--have someone watch you and stop you every time you do it; 4--gradually do it less and less until you just don't do it any more; 5--replace it with a good one.	1	0	1	1	3	0	4	2	15*20*	
21. The process of controlling and stopping one's reaction to a stimulus is called: 1--Self-control; 2--inhibition; 3--repression; 4--frustration; 5--desire.	23	8	0*14*		0	1	1	0	0	0

\*Correct answers.

Date		Description		Amount	
1900	Jan 1	Balance		100.00	
1900	Jan 15	Received from A. B.		50.00	
1900	Feb 1	Received from C. D.		25.00	
1900	Feb 15	Received from E. F.		75.00	
1900	Mar 1	Received from G. H.		100.00	
1900	Mar 15	Received from I. J.		150.00	
1900	Apr 1	Received from K. L.		200.00	
1900	Apr 15	Received from M. N.		250.00	
1900	May 1	Received from O. P.		300.00	
1900	May 15	Received from Q. R.		350.00	
1900	Jun 1	Received from S. T.		400.00	
1900	Jun 15	Received from U. V.		450.00	
1900	Jul 1	Received from W. X.		500.00	
1900	Jul 15	Received from Y. Z.		550.00	
1900	Aug 1	Received from A. B.		600.00	
1900	Aug 15	Received from C. D.		650.00	
1900	Sep 1	Received from E. F.		700.00	
1900	Sep 15	Received from G. H.		750.00	
1900	Oct 1	Received from I. J.		800.00	
1900	Oct 15	Received from K. L.		850.00	
1900	Nov 1	Received from M. N.		900.00	
1900	Nov 15	Received from O. P.		950.00	
1900	Dec 1	Received from Q. R.		1000.00	
1900	Dec 15	Received from S. T.		1050.00	
1900	Dec 31	Balance		1100.00	

Table 4. (continued)

Test Item	Choice Number									
	1		2		3		4		5	
	P	F	P	F	P	F	P	F	P	F
22. Special structures which receive stimuli from our environment are called: 1--Perceptors; 2--responsive; 3--sense organs; 4--end organs; 5--sensory neurons.	2	2	1	2	14*16*		0	0	6	3
23. The chemical sense to which all but four flavors are due is: 1--Taste; 2--smell; 3--degenerate; 4--touch; 5--sight.	19	7	2*14*		1	2	1	0	1	0
24. The type of reflex which probably controls all insect behavior is: 1--Automatic; 2--unconscious; 3--in born; 4--conditioned; 5--simple.	3	0	3	0	13*17*		1	0	4	6
25. An instinct is: 1--Complex reaction to a stimulus; 2--a cat catching a mouse; 3--something you do without thinking; 4--a group of related, inborn reflexes; 5--something you are born with.	4	2	0	1	3	2	6*11*		11	7
26. Instinctive behavior is most highly developed among: 1--People; 2--cats; 3--cattle; 4--insects; 5--social insects.	12	6	3	3	1	0	5* 5*		3	9
27. Advantages of instinctive social behavior are: 1--Division of labor and contentment; 2--no worry nor unemployment; 3--food and protection; 4--no labor problems; 5--no war.	8	7	0	4	16*11*		0	1	0	0
28. To achieve near perfection, insect social life sacrifices: 1--Education; 2--individual freedom; 3--vacations; 4--the family; 5--government.	6	4	13*18*		0	0	1	0	0	1
29. One major advantage of instinct over intelligence is: 1--Less work; 2--smarter reactions; 3--no problems; 4--nothing to learn; 5--more time.	0	1	14	3	1	0	9*19*		0	0
30. One major advantage of intelligence over instinct is: 1--Able to go to school; 2--adaptability to new situations; 3--remember what you see; 4--forget what you don't use; 5--social life.	1	0	16*23*		4	0	0	0	3	0

\*Correct answers.

Date		Description		Amount	
1890	Jan 1	Balance		100.00	
	Feb 1	Interest		5.00	
	Mar 1	Interest		5.00	
	Apr 1	Interest		5.00	
	May 1	Interest		5.00	
	Jun 1	Interest		5.00	
	Jul 1	Interest		5.00	
	Aug 1	Interest		5.00	
	Sep 1	Interest		5.00	
	Oct 1	Interest		5.00	
	Nov 1	Interest		5.00	
	Dec 1	Interest		5.00	
1891	Jan 1	Balance		100.00	
	Feb 1	Interest		5.00	
	Mar 1	Interest		5.00	
	Apr 1	Interest		5.00	
	May 1	Interest		5.00	
	Jun 1	Interest		5.00	
	Jul 1	Interest		5.00	
	Aug 1	Interest		5.00	
	Sep 1	Interest		5.00	
	Oct 1	Interest		5.00	
	Nov 1	Interest		5.00	
	Dec 1	Interest		5.00	
1892	Jan 1	Balance		100.00	
	Feb 1	Interest		5.00	
	Mar 1	Interest		5.00	
	Apr 1	Interest		5.00	
	May 1	Interest		5.00	
	Jun 1	Interest		5.00	
	Jul 1	Interest		5.00	
	Aug 1	Interest		5.00	
	Sep 1	Interest		5.00	
	Oct 1	Interest		5.00	
	Nov 1	Interest		5.00	
	Dec 1	Interest		5.00	

Table 4. (continued)

Test Item	Choice Number									
	1		2		3		4		5	
	P	F	P	F	P	F	P	F	P	F
31. One danger in intelligent behavior is: 1--Slip down to level of habits; 2--learn harmful things; 3--overwork and go to pieces; 4--know too much; 5--become too conceited.	5*	17*	15	4	3	2	0	0	2	0
32. Instead of waiting for physical evolution, man invented: 1--Tools; 2--genes; 3--machinery; 4--government; 5--schools.	10*	8*	0	1	8	3	0	1	5	9
33. The unit upon which human social life is founded is: 1--School; 2--city; 3--county seat; 4--family; 5--marriage.	8	3	0	0	0	0	9*	13*	6	6
34. Conditioned reflexes social in nature are called: 1--Etiquette; 2--customs; 3--taboos; 4--manners; 5--culture.	2	3	9*	4*	1	0	4	11	8	5
35. Man's invention which enables him to learn from others as well as from experience is: 1--Books; 2--language; 3--radio; 4--telegraph; 5--schools.	12	9	3*	7*	0	1	0	0	8	6
36. Two organs which made man's progress rapid are: 1--Brain and tongue; 2--head and heart; 3--hands and feet; 4--invention and education; 5--cerebrum and hand.	8	5	1	1	2	1	2	1	11*	15*
37. One of the most effective ways of learning is: 1--Take notes; 2--read out loud; 3--form mental pictures; 4--rewrite the material in your own words; 5--recite the material once a week.	2	0	3	0	12*	22*	4	0	3	1
38. One of the best ways to understand a new idea is: 1--Connect it with something you already know; 2--think it over carefully; 3--put it in your own words; 4--have it explained with pictures and models; 5--try to explain it to someone else.	10*	6*	2	1	0	0	1	1	11	15

\*Correct answers.



General Information				Particulars	
No.	Date	Particulars	Amount		
1	Jan 1	Balance	100.00		
2	Jan 5	By Cash	50.00		
3	Jan 10	To Cash	25.00		
4	Jan 15	By Cash	75.00		
5	Jan 20	To Cash	30.00		
6	Jan 25	By Cash	100.00		
7	Jan 30	To Cash	40.00		
8	Feb 5	By Cash	60.00		
9	Feb 10	To Cash	20.00		
10	Feb 15	By Cash	80.00		
11	Feb 20	To Cash	35.00		
12	Feb 25	By Cash	90.00		
13	Feb 28	To Cash	45.00		
14	Mar 5	By Cash	70.00		
15	Mar 10	To Cash	28.00		
16	Mar 15	By Cash	85.00		
17	Mar 20	To Cash	32.00		
18	Mar 25	By Cash	95.00		
19	Mar 30	To Cash	48.00		
20	Apr 5	By Cash	65.00		
21	Apr 10	To Cash	22.00		
22	Apr 15	By Cash	78.00		
23	Apr 20	To Cash	38.00		
24	Apr 25	By Cash	88.00		
25	Apr 30	To Cash	42.00		
26	May 5	By Cash	72.00		
27	May 10	To Cash	30.00		
28	May 15	By Cash	82.00		
29	May 20	To Cash	36.00		
30	May 25	By Cash	92.00		
31	May 30	To Cash	44.00		
32	Jun 5	By Cash	68.00		
33	Jun 10	To Cash	26.00		
34	Jun 15	By Cash	76.00		
35	Jun 20	To Cash	34.00		
36	Jun 25	By Cash	86.00		
37	Jun 30	To Cash	40.00		
38	Jul 5	By Cash	74.00		
39	Jul 10	To Cash	29.00		
40	Jul 15	By Cash	81.00		
41	Jul 20	To Cash	37.00		
42	Jul 25	By Cash	89.00		
43	Jul 30	To Cash	43.00		
44	Aug 5	By Cash	69.00		
45	Aug 10	To Cash	27.00		
46	Aug 15	By Cash	77.00		
47	Aug 20	To Cash	33.00		
48	Aug 25	By Cash	87.00		
49	Aug 30	To Cash	41.00		
50	Sep 5	By Cash	71.00		
51	Sep 10	To Cash	31.00		
52	Sep 15	By Cash	83.00		
53	Sep 20	To Cash	39.00		
54	Sep 25	By Cash	91.00		
55	Sep 30	To Cash	46.00		
56	Oct 5	By Cash	73.00		
57	Oct 10	To Cash	24.00		
58	Oct 15	By Cash	79.00		
59	Oct 20	To Cash	35.00		
60	Oct 25	By Cash	84.00		
61	Oct 30	To Cash	47.00		
62	Nov 5	By Cash	67.00		
63	Nov 10	To Cash	23.00		
64	Nov 15	By Cash	75.00		
65	Nov 20	To Cash	32.00		
66	Nov 25	By Cash	85.00		
67	Nov 30	To Cash	45.00		
68	Dec 5	By Cash	70.00		
69	Dec 10	To Cash	28.00		
70	Dec 15	By Cash	80.00		
71	Dec 20	To Cash	38.00		
72	Dec 25	By Cash	90.00		
73	Dec 30	To Cash	44.00		
74	Jan 1	Balance	100.00		

Table 4. (continued)

Test Item	Choice Number									
	1		2		3		4		5	
	P	F	P	F	P	F	P	F	P	F
39. That which partially controls one's behavior by determining his capacity to respond to stimuli is: 1--Habits; 2--emotions; 3--environment; 4--intelligence; 5--heredity.	1	1	9	14	5	1	8	5	1*	2*
40. That which partially controls behavior by supplying or failing to supply stimuli is: 1--Habits; 2--emotions; 3--environment; 4--intelligence; 5--heredity.	3	1	7	5	8*12*		3	3	3	0
41. In order to fit into changing conditions and survive a plant or animal must: 1--Adapt itself; 2--be able to learn; 3--modify its usual behavior; 4--migrate; 5--defend itself.	23*17*		0	1	0	3	1	0	0	2
42. The three strongest controls of human behavior are: 1--Past experience, present condition, present surroundings; 2--love, hate, fear; 3--heredity, training, present conditions; 4--intelligence, emotions, habits; 5--heredity, environment, will power.	2	1	5	3	1	0	5*19*		11	0
43. The secret of successful living is: 1--Carefully develop useful habits until you are well trained for your chosen work; 2--never give up; 3--decide what you want and go after it with all your strength; 4--cooperative balance between intelligence and emotions, with habits a labor-saving device; 5--be alert and adaptable.	3	1	4	0	5	7	7*11*		5	4
44. A state of consciousness still in the experimental stage is: 1--Sleep learning; 2--spiritualistic trance; 3--sleep walking; 4--suspended animation; 5--hypnotism.	6	1	2	1	3	1	2	2	10*18*	
45. Things we cannot yet explain are often blamed to the: 1--Government; 2--supernatural; 3--tempo of living; 4--Garden of Eden; 5--depression.	0	1	9*15*		11	4	0	0	2	1

\*Correct answers.

1900				Total
Jan	Feb	Mar	Apr	
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50
51	52	53	54	55
56	57	58	59	60
61	62	63	64	65
66	67	68	69	70
71	72	73	74	75
76	77	78	79	80
81	82	83	84	85
86	87	88	89	90
91	92	93	94	95
96	97	98	99	100

Table 4. (concluded)

Test Item	Choice Number					
	A		B		C	
	P	F	P	F	P	F
46. Man has greater capacity to develop conditioned reflexes than any other animal. A--Scientific fact; B--conclusion from proved fact; C--opinion.	13*	15*	8	8	1	0
47. There is great need to improve human social behavior.	4	5	5*	5*	13	13
48. Thousands of men and women cooperate daily in a large manufacturing plant.	1	2	13*	15*	3	6
49. Tools have played a very important part in changing human society.	9	7	11*	14*	2	2
50. Education is one of society's tools whereby each new generation is enabled to begin where the last left off, rather than at scratch, as most other animals do.	11	10	8*	10*	3	3
51. Human beings can and do learn to cooperate.	13	6	5*	15*	3	2
52. Most human beings are greedy and selfish and will always remain so.	1	1	4	3	17*	19*
53. Man will always be the dominant animal on earth.	3	8	5	2	13*	13*
54. You cannot change human nature.	10	1	3	1	7*	21*
55. War cannot be eliminated from human society.	1	5	8	6	11*	12*
56. Children seem to be born fearing loud noises. A two-year old child heard a loud noise when he first saw a goldfish bowl, and developed a fear of it. His father tried several remedies. A--He had an older brother show pleasure at sight of the goldfish bowl; B--he told the child repeatedly that the goldfish would not hurt him; C--he gave the child a dish of favorite food and set the goldfish bowl at the far end of the table. Each day he brought the bowl a little nearer. Which of the procedures do you suppose cured the child of his fear? Why? Explain your reasons on the back of this paper.	4	6	2	1	13*	16*
57. Make a clear, labeled diagram of the human eye or ear. (On back.)	7	11				
Eye:	7	11				
Ear:	5	12				

\*Correct answers.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry, no matter how small, should be recorded to ensure the integrity of the financial data. This section also outlines the procedures for reconciling accounts and identifying discrepancies.

The second part of the document provides a detailed analysis of the company's performance over the past year. It includes a comparison of actual results against budgeted figures and identifies areas where the company has exceeded expectations. The analysis also points out areas where performance was below target and suggests corrective actions.

The third part of the document discusses the company's financial position and its ability to meet its obligations. It includes a breakdown of the company's assets and liabilities and a discussion of the company's cash flow. This section also provides a forecast of the company's financial performance for the next year.

The fourth part of the document discusses the company's human resources and its plans for the future. It includes a discussion of the company's current workforce and its plans for recruiting and training new employees. This section also discusses the company's plans for expanding its operations and increasing its market share.

The fifth part of the document discusses the company's marketing and sales strategy. It includes a discussion of the company's current marketing efforts and its plans for increasing its sales. This section also discusses the company's plans for developing new products and services.

The sixth part of the document discusses the company's legal and regulatory compliance. It includes a discussion of the company's current legal obligations and its plans for ensuring compliance with all applicable laws and regulations. This section also discusses the company's plans for implementing a robust risk management program.

The seventh part of the document discusses the company's overall strategy and its plans for the future. It includes a discussion of the company's long-term goals and its plans for achieving them. This section also discusses the company's plans for improving its operational efficiency and reducing its costs.

The eighth part of the document discusses the company's financial performance and its plans for the future. It includes a discussion of the company's current financial position and its plans for improving its financial performance. This section also discusses the company's plans for increasing its profitability and improving its return on investment.

The ninth part of the document discusses the company's environmental and social responsibility. It includes a discussion of the company's current environmental and social practices and its plans for improving them. This section also discusses the company's plans for implementing a robust corporate governance program.

The tenth part of the document discusses the company's overall performance and its plans for the future. It includes a discussion of the company's current performance and its plans for improving it. This section also discusses the company's plans for increasing its transparency and accountability to its stakeholders.



some pupils persisted in a difference of opinion which the author did not feel justified in suppressing.

No. 32. From the class discussion, pupils might have concluded that machinery or schools was the best answer. Both had marked increases in the final test. Instead of being too easy, the alternative choices were perhaps too difficult.

No. 34. The lower final score on this item is the fault of the teaching. Both customs and manners were discussed but slightly, and manners are more tangible to the average pupil.

No. 38. The amount of discussion and forcefulness of discussion are probably responsible for the confusion on this item. The correct answer (1) was stated to be the best, but there was more time spent on the fifth choice in class discussion.

No. 41. As most of the class still had the correct answer in the final test, and all but one had it in the pre-test, the decrease represents not confusion but rather a choice of English and greater awareness of the problem.

No. 48. This item was hardly mentioned in the unit. In our discussions recognition was given to labor and other social problems, making some pupils aware of problems they perhaps did not previously know existed. The item was included, with several others, to discover how well the pupils could apply some of the things they had learned.

Items unchanged. No. 26. This item really improved, as choices four and five might be debated for superiority. The second point tested by this item was whether the class realized that the existence of human

The subject of the present paper is the question of the possibility of a general theory of the history of science. This question has been discussed by many philosophers of science, but no general agreement has been reached. Some, like Karl Popper, have argued that the history of science is a series of conjectures and refutations, while others, like Thomas Kuhn, have argued that it is a series of paradigm shifts. The present paper will attempt to provide a general theory of the history of science, based on the idea of the scientific method. The scientific method is a process of inquiry that involves the formulation of hypotheses, the collection of data, and the testing of hypotheses. This process is repeated until a hypothesis is accepted as a theory. The history of science is the history of this process, and it is the task of the philosopher of science to provide a general theory of this process. The present paper will argue that the history of science is a series of paradigm shifts, and that the scientific method is the process by which these shifts occur. The present paper will also argue that the history of science is a series of conjectures and refutations, and that the scientific method is the process by which these conjectures are tested. The present paper will conclude that the history of science is a series of paradigm shifts, and that the scientific method is the process by which these shifts occur.

instinct is doubtful, and the number in the class selecting that choice (1) diminished by half. Hence this item really improved.

No. 47. This point was not "put across." Most of the class still believed that it is a matter of opinion.

No. 53. There was slight improvement on this item, since fewer pupils considered the statement scientific fact, and more considered it a conclusion. More improvement would probably have resulted had the point been discussed in class instead of being casually mentioned as a side issue once.

Items improved. Of the 46 improved items, ten ended in a perfect or almost perfect score: 1, 2, 4, 5, 7, 17, 20, 30, 37, and 54. Two-thirds of the class knew four items to begin with: 1, 17, 30, and 52. On 14 of the 46 items the number of correct responses doubled or more than doubled and were given by a majority of the class: 4, 5, 7, 9, 11, 13, 14, 21, 23, 29, 31, 42, 51, and 53.

Comparing the test results with the delimitation of the unit (pages 15 to 21), the results seem as follows.

Well understood: 1, 2, 3, 5, 7, 8, 10, 11, 12, 13, 14, 15, 19, and 21.

Poorly understood: 16, 20.

Not sufficiently covered by the test: 4, 6, 9, 17, and 18.

The five basic ideas not thoroughly covered by the test were covered by other unit activities.

Test items that would need more emphasis another year are 3, 6, 9, 10, 11, 12, 13, 14, 15, 18, 19, 21, 23, 25, 26, 27, 32, 33, 34, 35, 38,



39, 40, 43, 47, 48, 49, 50, 53, and 55. Of these, 6, 15, 32, 35, 47, 48, 49, 50, 53, and 55 were scarcely discussed, but inserted to discover how pupils would apply some of the things they had learned. These questions might be eliminated, changed, or discussed another year. Nos. 26 and 38 should be changed, and 27, 33, and 35 are controversial. This means that teaching needs to be strengthened mostly on items 3, 9, 10, 11, 12, 13, 14, 18, 19, 21, 23, 25, 26, 39, 40, and 43: 15 of 57 items. Of these, the ones that appear to be failures this year are 3 and 39, and 3 is not so much a failure as misplaced emphasis on a functionally minor point. Item 39 is a disappointment, and yet the fact that a majority of the class selected emotions is not far wrong, and does indicate that the author was successful in teaching the pupils the great and commonly overlooked importance of emotions.

Table 5 summarizes the results of the pre-test in another way, as does Table 6 for the final test. They show how each pupil responded to each test item, and may be used to compare the showing of achievement groups. Because of the small class, it was divided into three groups rather than five, and on the basis of number of pupils rather than of standard deviation.

Tables 5 and 6 also show that the upper third of the class had more trouble with items 25, 31, 38, 40, 44, and 51 in the pre-test than did the rest of the class. In the final test, this was true of items 33, 38, 49, and 51.

Item 25 (definition of instinct) was answered correctly in a non-technical sense (5) by six of the eight best pupils, more technically (1)





Table 5. Results of the Pre-Test Given on November 17, 1941, Arranged by Pupils in Order of Rank, to Show Achievement on Each Test Item.<sup>1/</sup>

Pupils	Test Items																																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33		
A			x	x	x	x	x	x			x	x	x		x			x	x		x		x		x	x	x				x		x		
B			x	x	x	x	x				x	x	x	x	x						x		x		x	x		x			x	x			
C			x	x	x	x	x		x	x	x	x	x	x	x			x	x		x		x		x			x		x	x				
D	x	x		x		x	x		x	x	x	x	x	x	x			x	x		x		x		x			x			x		x		
E			x	x	x	x						x	x		x			x		x	x	x	x				x		x		x	x			
F	x			x		0	0	x		x	x	x	x	0	x				x	x	x	0	x	x	x	x			x		x	x	x		
G			x	x	x	x	x		x	x	x	x	x	x	x						x		x		x	x				x	x	x	x		
H		x	x	x		x	x	x		x		x	x	x	x			x	x		x				x	x		x			x	x	x		
I	x		x	x		0	x			x	x	x	x	x	x				x		x		x		x	x	x	x			x	x	x		
J		x		x	0	x	x	x	x	x	x	x	x	x	x					x	x		x	x	x	x			x	x	x		x		
K			x	x	x	x	x		x	x	x	x	x	x	x			x	x		x	x	x	x				x					x		
L	x	x	x	x	x	x	x		x	x	x	x	x	x	x						x		x					0	x		x		x		
M			x	x	x	0	x		x	x	x	x	x	0	x			x			x	x	x	x			x		x	x	x	x			
N		x	x	x		x	x	x			x	x	x	x	x			x	x		x	x	x				x	x	x	x	x	x	x		
O	x	x	x	0	0	0	0	x	x	0		x	x	0	x	0				x	x		x				x	x	0	x		x	0	x	
P			x	x	x	x		x	x	x	x	x	x	x	x			x	x		x	x	x		x	x				x	x				
Q			x	x	x	0	x		x	x		x	x	0	x			x			x	x	x				x			x	x	x			
R			x	x		0			0	0	0	x	x	0	0		x	x	x		x		x	x	x	x		0	x				x	0	
S			x	x	x	x	x		x	x	x	x	x	x	x		x			x	x	x	x	x	x	x			x		x	x			
T	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	x		x	x	x	x			
U		x	0	x		x	x	x	x	x	0	x	x	0	x	0	0	0	x	0	x	0	x	0	x	x		0	x				x	x	
V		x	x	x		x		x	x	x		x	x	x	x			x	x		x	x	x		x			x					x	x	
W			x	x	x	x	x		x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x	x	x				x	
X	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	x	x	x	x		x		x	x		x	x						

<sup>1/</sup>An x indicates wrong answer,  $\frac{1}{2}$  means  $\frac{1}{2}$  right, 0 indicates question not answered, and a blank indicates correct answer.

by one, and correctly (4) by one. The better showing of the rest of the class was probably by chance.

Item 31 (dangers in intelligent behavior) brought (2) from seven of the eight, and (5) from the other. From a sensible viewpoint, they picked the best answer one could make before studying the unit, and the



Table 5.<sup>1/</sup> (concluded)

Pupils	Test Items																												Right	Wrong	Half Right	Blank
	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80					
A		x				x	x				x														$\frac{1}{2}$	33	23	1	0			
B	x					x	x	x			x	x	x				x	x	x					x	$\frac{1}{2}$	28	28	1	0			
C	x	x		x					x		x	x						x	x					x	$\frac{1}{2}$	27	29	1	0			
D		x			x	x	x				x	x	x	x	x				x						$\frac{1}{2}$	26	30	1	0			
E			x		x	x	x		x	x	x	x	x	x				x	x	x			x	x	$\frac{1}{2}$	24	33	0	0			
F		x			x	x			x	x	x				x				x						0	23	29	0	5			
G		x	x	x	x	x	x		x	x					x				x	x					x	23	34	0	0			
H	x	x		x	x	x	x		x	x	x													x	x	23	34	0	0			
I	x	x	x			x	x			x	x			x	x				x	x			$\frac{1}{2}$	x	22	33	1	1				
J		x		x		x			x		x	x			x	x		x					$\frac{1}{2}$	x	22	33	1	1				
K	x			x		x			x	x			x	x	x	x		x	x	x	x	x	x	0	21	35	0	1				
L	x	x	x	x	x	x	x		x		x				x	x			x	x			x	0	20	35	0	2				
M	x	x	x			x			x	x	x					x	x						0	0	20	30	0	7				
N	x	x	x	x	x	x	x		x	x	x	x				x								$\frac{1}{2}$	20	36	1	0				
O	0	0				x			x	x	0					x								0	20	25	0	12				
P	x	x	x	x	x	x	x					x	x	x			x	x	x					0	19	34	0	4				
Q	x	x				x			x	x		x	0	0	0	0	0	0	0	0	0	0	0	0	19	24	0	14				
R		x	x	x	x	x	x		x	x		0		x				x					x	x	0	18	28	0	11			
S		x	x		x	x	x		x	x	x	x	x						x	x	x	x		x	16	41	0	0				
T	x	x	x			x	x		x						x					x	x			x	0	16	40	0	1			
U	x	x	x	x	x	x	x		x	x	x	x	x					x					x	0	16	36	0	5				
V	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		0	0	14	41	0	2				
W	x	x		x		x			x	x				x			x	x	x	x	x	$\frac{1}{2}$	0	14	42	0	1					
X	x	x	x			x	x	x				0	0	0	0	0	0	0	0	0	0	0	0	0	12	32	0	13				

<sup>1/</sup>An x indicates wrong answer,  $\frac{1}{2}$  means  $\frac{1}{2}$  right, 0 indicates question not answered, and a blank indicates correct answer.

author's insistence on (1) as the best answer is open to argument.

Item 38 (how to understand a new idea) was correctly answered (1) by two of the eight. The other six chose (5), which shows that they knew quite a bit about learning.

On item 40 (environment) there was no such agreement. All five choices were used by one or more of the eight pupils. The same was true





Table 6. Results of the Final Test Given on January 16, 1942, Arranged by Pupils in Order of Rank, to Show Achievement on Each Test Item.<sup>1/</sup>

Pupils	Test Items																																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33			
C			x			x					x												x		x	x	x								x	
A						x												x										x							x	
E			x			x				x					x	x											x								x	
D						x									x												x	x							x	
I																																				
H		x	x		x					x					x					x	x							x							x	
J			x				x																													
G			x						x	x	x					x								x											x	
B				x																																
O			x			x	x					x	x						x								x	x							x	
F			x			x		x														x					x	x	x							
N			x						x	x												x	x												0	
K			x			x		x																											x	
Q			x				x	x	x	x																									x	
P			x			x					x	x	x																						x	
M			x		x	x					x					x	x	x																	x	
T																																				
W			x			x		x	x	x																									x	
X			x																																	
R						x	x																													x
L		x	x			x		x	x																											x
U		x	x						x	x																										x
V		x	x			x		x	x	x	x																									x

<sup>1/</sup>An x indicates wrong answer,  $\frac{1}{2}$  means  $\frac{1}{2}$  right, 0 indicates question not answered, and a blank indicates correct answer.

of item 44 (hypnotism).

On item 51 (human cooperation) six believed it was scientific fact, one, opinion, and one had it right.

On the final test, the upper third did better on items 25, 31, 40, 44 (perfect score), and 51, but showed no improvement on item 38 and,

Table 1	
Year	Value
1980	100
1981	105
1982	110
1983	115
1984	120
1985	125
1986	130
1987	135
1988	140
1989	145
1990	150
1991	155
1992	160
1993	165
1994	170
1995	175
1996	180
1997	185
1998	190
1999	195
2000	200
2001	205
2002	210
2003	215
2004	220
2005	225
2006	230
2007	235
2008	240
2009	245
2010	250
2011	255
2012	260
2013	265
2014	270
2015	275
2016	280
2017	285
2018	290
2019	295
2020	300

Table 6.<sup>1/</sup> (concluded)

Pupils	Test Items																													Right	Wrong	Half Right	Blank
	32	33	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57									
C	x				x																						47	10	0	0			
A	x	x			x	x	x							x				x									46	11	0	0			
E					x					x				x		x	x							x			44	13	0	0			
D		x			x	x	x	x						x	x			x									43	14	0	0			
I	x				x	x		x						x	x		x	x	x	x			x			41	16	0	0				
H	x	x			x		x														x					39	18	0	0				
J		x			x	x		x						x	x	x		x								38	19	0	0				
G	x		x		x	x	x	x		x				x	x		x							x		38	19	0	0				
B					x	x	0			x				x						x						37	19	0	1				
O		x				x	x							x	x	x							x		x	37	20	0	0				
F	x	x			x	x				x		x		x				x		x		x				35	21	0	1				
N	x				x	x	x				x	x		x						x		x				35	22	0	0				
K	x					x	x							x	x		x	x				x	x			34	23	0	0				
Q	x	x				x	0					x	x		x	x	x			x			x	x		34	22	0	1				
P	x	x			x	x	x			x				x	x		x			x		x	$\frac{1}{2}$	$\frac{1}{2}$		32	23	2	0				
M	x		x		x	x					x	x			x		x					x	x	x		31	26	0	0				
T	x	x	x		x	x			x	x	x			x						x				x		30	27	0	0				
W	x	x				x			x	x		0		x	x		x	x				x		$\frac{1}{2}$		28	27	1	1				
X	x	x	x			x				x				x	x		x	x						$\frac{1}{2}$		28	29	0	0				
R	x	x	x		x	x	x		x		0			x								x	x	$\frac{1}{2}$		27	28	1	1				
L	x	x	x		x	x			x	x							x			x		x	x	$\frac{1}{2}$		26	30	0	1				
U	x	x	x		x	x	x			x	x	x		x		x				x		x	x			26	31	0	0				
V	x	x	x	x	x	x		x		x	x	x	x	x	x		x		x	x	x	x	0	$\frac{1}{2}$		17	38	1	1				

<sup>1/</sup>An x indicates wrong answer,  $\frac{1}{2}$  means  $\frac{1}{2}$  right, 0 indicates question not answered, and a blank indicates correct answer.

while improved, was still poorer on item 51 than the rest of the class.

The reason for the failure on item 38 has been previously explained, page 74.

Item 33 in the final test (unit of society) was correctly answered by three of the first eight pupils, two picked (1), and three, (5).

On item 49 (tools in society) two considered it scientific fact,

No.	Name	Age	Sex	Religion	Marital Status	Occupation	Education
1	John Doe	35	M	Protestant	Married	Teacher	High School
2	Jane Smith	28	F	Catholic	Single	Nurse	College
3	Robert Brown	42	M	Jewish	Married	Engineer	University
4	Mary White	30	F	Muslim	Married	Homemaker	High School
5	David Green	25	M	Buddhist	Single	Student	College
6	Elizabeth Black	45	F	Hindu	Married	Teacher	University
7	William Grey	38	M	Sikh	Married	Businessman	High School
8	Anna Lee	22	F	Christian	Single	Student	College
9	Thomas King	50	M	Protestant	Married	Retired	High School
10	Sarah Hall	33	F	Catholic	Married	Teacher	University
11	Michael Scott	27	M	Jewish	Single	Engineer	College
12	Linda Adams	40	F	Muslim	Married	Homemaker	High School
13	Christopher Baker	31	M	Buddhist	Married	Student	College
14	Patricia Wilson	48	F	Hindu	Married	Teacher	University
15	James Taylor	29	M	Sikh	Single	Businessman	High School
16	Karen Moore	24	F	Christian	Single	Student	College
17	Richard Hill	55	M	Protestant	Married	Retired	High School
18	Michelle Young	36	F	Catholic	Married	Teacher	University
19	Andrew King	26	M	Jewish	Single	Engineer	College
20	Stephanie Clark	41	F	Muslim	Married	Homemaker	High School

Summary of data collected from the survey. The following table shows the distribution of respondents by age group, sex, and religion.

Age Group	Sex	Religion	Count
18-24	Male	Protestant	1
18-24	Female	Catholic	1
25-34	Male	Jewish	1
25-34	Female	Muslim	1
25-34	Male	Buddhist	1
35-44	Female	Hindu	1
35-44	Male	Sikh	1
35-44	Female	Christian	1
45-54	Male	Protestant	1
45-54	Female	Catholic	1
45-54	Male	Jewish	1
45-54	Female	Muslim	1
45-54	Male	Buddhist	1
45-54	Female	Hindu	1
45-54	Male	Sikh	1
45-54	Female	Christian	1
55-64	Male	Protestant	1
55-64	Female	Catholic	1
55-64	Male	Jewish	1
55-64	Female	Muslim	1
55-64	Male	Buddhist	1
55-64	Female	Hindu	1
55-64	Male	Sikh	1
55-64	Female	Christian	1

The following table shows the distribution of respondents by marital status and occupation.

Marital Status	Occupation	Count
Single	Teacher	1
Single	Nurse	1
Single	Engineer	1
Single	Student	1
Single	Businessman	1
Single	Retired	1
Married	Teacher	1
Married	Homemaker	1
Married	Student	1
Married	Businessman	1
Married	Retired	1

two, opinion, and four had it right.

On both items 33 and 49 the fact that the better pupils made a slightly poorer showing is probably because they saw more to the problem than the poorer pupils; they were aware of some of the implications involved.

Table 7 shows the improvement made by pupils on the test items during the unit, and their rank order on pre-test, final test, and improvement.

Table 7. Rank Order of Pupils on Pre-Test, Final Test, and Improvement During Unit.

Rank	Pupils			
	Pre-Test	Final Test	Improvement	Increase in Right Items
(1)	(2)	(3)	(4)	(5)
1	A	C	E	21
2	B	A	C	$19\frac{1}{2}$
3	C	E	I	19
4	D	D	O	18
5	E	I	D	$16\frac{1}{2}$
6	F	H	H	16
7	G	J	X	16
8	H	G	J	$15\frac{1}{2}$
9	I	B	G	15
10	J	O	Q	15
11	K	F	N	$14\frac{1}{2}$
12	L	N	W	$14\frac{1}{2}$
13	M	K	P	14
14	N	Q	T	14
15	O	P	K	13
16	P	M	A	$12\frac{1}{2}$
17	Q	T	F	12
18	R	W	M	11
19	S	X	U	10
20	T	R	R	$9\frac{1}{2}$
21	U	L	B	$8\frac{1}{2}$
22	V	U	L	6
23	W	V	V	$3\frac{1}{2}$
24	X			





Results of activities.-- Most of the class completed successfully all of the 35 written items, and participated in the discussions. Some of the more interesting written items, some not entirely correct, are quoted or summarized as follows.

Item 8. The average reaction time of the class members was about  $\frac{1}{4}$  second.

Item 9. "In the patellar reflex we tapped with a ruler, just below the kneecap. After doing this for a few times we hit in the right spot, and the leg jerked forward. On some people it went out quite far, on others just about an inch."

Item 10. "After the clicker had been clicked in unison with the dropping of the ball several times in a row, the person began to associate the two. Soon the student involuntarily withdrew his hand when the clicker was clicked regardless of whether the ball had been dropped or not."

Item 11. "Waking up till going to school: blinking, yawning, stretching, shivering, breathing, desire to eat, digestion, smiling, scowling, jerking hand away from something hot, jumping at unexpected noise, size of pupil of eye changing."

"Heart-beat and breathing. Withdraw hand from hot radiator. Adjust eyes to light conditions. Jump, at hearing of loud noise. Saliva flows while eating. Jaws open upon biting the tongue. Digestion starts after eating. Occasionally blink eyes. Close eyes when foreign object enters. Shiver when going out-doors. Feeling of coldness in the ears. Motor nerves allow moving about. Cerebellum controls sense of balance

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the twenty-eighth is the fact that the  
the twenty-ninth is the fact that the  
the thirtieth is the fact that the

and muscular coordination."

"Jumping when the alarm-clock rings. Shivering when you put the window down. Yawning as you dress. Blinking as kitten jumps up on you to say good morning. Coughing as you swallow some tooth-powder. Eyes watering as you cut up onions for meat flavoring. Jumping away as you touch hot tea-kettle. Laugh at break-fast table as someone smiles during grace. Smile as you meet people on the street. Trembling as you remember a test."

Item 12. "Leaving school till in bed. Gathering up books at the sound of first bell. Leaving room on second bell. Answering to my name being called. Stopping in act of throwing basketball when whistle is blown. Jumping out of street when a car's horn is blown. Getting hungry at the smell of dinner cooking. Hurrying to the table when dinner is announced. Ducking when anyone calls, 'Duck.'"

"Wake up until entering school: 1. Throwing off the covers. 2. Turning off the alarm clock. 3. Shutting the window. 4. Putting on my slippers. 5. Going downstairs. 6. Throwing water in my eyes. 7. Buttering my bread. 8. Buttoning my coat. 9. Running when I hear school bell. 10. Getting up at seven and hurrying to get ready for school on holidays. Inborn reflexes seem to be more numerous than conditioned reflexes."

"When I hear my brother leave I know it is almost six o'clock. When I hear my mother close the hall door I know it is time to get up. When I hear the whistle at the shop I know it is five minutes of seven, when I hear it again I know that it is seven o'clock. When I hear the





dishes rattling I know that my mother is getting breakfast. When I hear the kitchen door slam I know that my father is coming in from the barn. I know the way he closes it. When I see a gray car coming I know that it is W's and that I am to go to school with them. When I get to school I know that one bell means to be in our seats and be silent. The next one is to go to class."

Item 13. "Writing--first grade of school; reading--first grade of school; talking--when a small child; stop study at first bell--seventh grade; whispering in class--first grade of school; write name, date, class, on papers--first year high; obeying traffic regulations--several years ago; jump at conclusions--in childhood."

"1. Turning on a light--October, 1941. 2. Putting on my glasses--1936. 3. Dressing--1929. 4. Combing my hair--1935. 5. Turning on the radio--1940. 6. Biting my fingernails--1931. 6. Washing up--1934. 8. Brushing my teeth--1931. 9. Shutting the window--1939. 10. Eating breakfast--1927. 11. Putting on my slippers--1934. 12. Shutting the door--1932. 13. Getting my books--1939. 14. Brushing my clothes--1938. 15. Saying 'Goodbye'--193. 16. Running to get there on time--1939. 17. Listening for the bell--1939. 18. Calling for H.--1940. 19. Saying 'Hello'--1930. 20. Going the same way--1936. 21. Putting on and taking off my coat--1931."

"1. Not wanting to get up in the morning. 2. Riding bicycle. 3. Not getting my work done on time."

"Leaving school till in bed: Returning to home room after last bell.--When I first started high school this habit was formed. Going

The first of these is the fact that the  
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the fifteenth is the fact that the

directly to my home room seat.--Formed at first of this year. Carrying my books under my right arm. Formed when I first had homework. Walking very fast--From walking with other girls who walk rapidly. Talking too fast. Putting off studying till the last minute--Formed in eighth grade when I began to take part in more outside activities. Scowling when I read or write. Going home from school and coming to school by the same route--Formed when I first started to call for C. C. Fiddling with any bracelet I may have on. Going to bed at a definite time--Formed when small. Listening to the radio at certain hours. Eating at a certain time--Formed when small. Wasting a lot of time. Washing my teeth before going to bed--Formed when small. Washing my hands before dinner--Formed when small. Dressing and undressing--Formed when I first learned to dress myself. Leaning on my elbows when studying--Formed when I first had studying to do."

"Tie my shoes--1930. Tie my tie--1937. Button my shirt--1929. Turn on the radio--1940. Brush my teeth--1931. Comb my hair--1936. Going to school--1932. Shutting my window--1937. Washing my face and ears--1934. Getting my coat and hat--1932. Kissing my mother before going to school--1932. Talking out in class-1938. Swearing--1933. Wiping dishes--1937. Whistling--1933. Loading my gun--1941. Taking my lunch--1938. Getting the paper--1937."

"Chewing my thumb nails. Leaving combed out hair on the bathroom shelf. Leaving my clothes on the furniture downstairs. When skating always cutting to the right. Always bouncing the ball in basketball. Instead of stepping straight on my foot when walking I step on the side,



thus turning over my shoes. Twisting and playing with my rings or bracelets. Parting my hair on the left side. Wearing my watch on my right wrist. Writing my name, on school papers, in the upper right hand corner. When sitting at a desk, leaning my head on my hand."

Item 14. "I would like to form the habit of walking straight on my feet instead of on the side. This habit causes my shoes to be runover and I would like to stop it.

"The first I would do would be stop and think every-time I sit down, to place my feet straight on the floor.

"Every time I don't do this it would help if someone reminded me and if I took time to think about it.

"Every time I walk home, I could think about every step and then step straight on my heel. By constantly trying and thinking about this I think that I will in time, not run over my shoes."

"The habit which I want to form is that of doing all of my practicing early in the afternoon instead of some or all in the evening.

"In the first place I must want to do it. Then I must begin doing it--not as a dull drill; but as a practice by which I will gain. And lastly, I must do this every single day, allowing no exceptions until I do it without thinking. In this way the habit will be formed easily and quickly."

"A habit which I want to form is that of exercising and breathing deeply every morning, to rid my lungs of the stale air. To go about forming this habit, I should think it over well and make a strong decision that I want to form it. Then I should make a strong start and do





it continuously every morning, allowing no exceptions until the act is learned."

"I would like to form the habit of standing up straight and having good posture all the time. This is the way I would go about it:

"Around the house I would practice walking around with a book on my head. Also I would have my family give me a good slap on the back when they caught me slumping. I would try other good exercises. Most important of all is to try to do it and want to. Anytime or anyplace I would remember to hold my chin up, pull my shoulders back and walk on to better posture."

"I don't know any habit I want to form but the best way to form it is to put your mind on it and practice it. Then try to do it without thinking of it. Later you'll be able to do it without knowing your doing it."

"I should like to form the habit of going to sleep as soon as possible after getting into bed as I am now I get into bed and generly think about a number of defferent things for some time. Of course it may be said that this is no habit, it may not be, but it is my opinion that it is for I, at the present time, get into bed and unless I get my mind on it I Will lie awake for hours thinking. Thinking is a vary good thing but when I get up the next morning feeling vary tired then I think that I should think a little less and sleep more. I hope to do this by trying not to get my mind onto any speasal subject befor going to bed and when I do get into bed I hope to compleatly relax and shut my mind, as much as passable and trying to go to sleep. This may seem easy to

the first of these, the second is a more or less complete  
reproduction of the first.

The second of these, the third is a more or less complete  
reproduction of the first.

The third of these, the fourth is a more or less complete  
reproduction of the first.

The fourth of these, the fifth is a more or less complete  
reproduction of the first.

The fifth of these, the sixth is a more or less complete  
reproduction of the first.

The sixth of these, the seventh is a more or less complete  
reproduction of the first.

The seventh of these, the eighth is a more or less complete  
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The tenth of these, the eleventh is a more or less complete  
reproduction of the first.

The eleventh of these, the twelfth is a more or less complete  
reproduction of the first.

The twelfth of these, the thirteenth is a more or less complete  
reproduction of the first.

The thirteenth of these, the fourteenth is a more or less complete  
reproduction of the first.

some people but to me who has spent money hours thinking before going to sleep it is not so easy. I know or feel sure that my sleeplessness is due to this thinking and not to something else for on rare occasion I have done just what I hope to do in the future and if all goes well will do."

The author called the boy in and suggested some other simple sleep-producing rules, and the unit references which deal with the problem.

"One habit I would like to form is to be prompt. To be able to know I'm going to get to my destination on time, or a little before time.

"One way to form it, would be to have an extra five or ten minutes. Another way would be to see how much time it usually takes me to go to different places, then allow myself enough time to get there. If I practiced those rules, being prompt would probably become a habit."

"I want to form the habit of not talking out in class.

"When I go to class I will think over about talking in class. After thinking it over I will try to stop talking out. In a day my habit will be pretty well broken. The next day I will try harder, and with the aid of the teachers I will succeed to stop talking out in school. If you are determined you can form a new habit very shortly. I also think that if you think over your new habit that that will help you a lot too."

Other pupils want to form the habit of studying on time (5), brushing teeth, doing things when supposed to, stop biting finger nails, and take iron pills.

Item 17. A majority found the finger tips most sensitive, with





the lips a close second, and the back least sensitive.

Item 21. Results varied from 4 inches to 13 feet, with 30 feet for a clock. Watches vary as well as ears. The average answer was 4 to 5 feet.

Item 24. Twelve pupils found the right eye dominant, and nine, the left.

Item 25. "After looking hard at a patch of red, I saw a green color when I shut my eyes. This is called a 'negative after-image' because the contrasting color of red, which is green, appeared as an 'after-image.'"

"A negative after-image is an image seen after looking at a bright color and shutting your eyes. It is generally a contrasting color."

"After looking hard at a patch of red I closed my eyes. I saw a light greenish square surrounded by red.

"This is called a negative after image because the image is just the opposite of what you saw when you had your eyes open."

"After looking at a red square you see a green square surrounded by red. This is a negative after-image as green is the opposite of red."

"When you look at a color for a minute and then shut your eyes you see its 'complementary color.' That is, the color that goes best with it as,--red, green; blue, yellow, etc. I looked at red and saw green, looked at blue and saw yellow streaks, and looked at green and saw red-gray."

Item 26. "After a bright color on a neutral background is stared



at, the opposite color to the one being stared at will appear around the edge. This is called a color contrast."

"A contrasting color will appear after looking hard at a very bright spot. If the bright spot is red, a rim of green will appear around it, which is the contrasting color."

"When you stare at a square on a gray background you see soon a rim of its complementary color around it. I looked at a red square and saw a green rim, a blue square had a yellow rim, and the green square had a red rim."

Item 28. "Perception is the way in which we interpret the the messages that are sent to the brain by the five sense organs of sight, smell, taste, hearing, and touch."

"Perception is the way we interpret the stimuli of our five senses."

Item 29. "Yes, thinking is work. When the plank is balanced, the person is given a problem in mental arithmetic. When the person thinks hard the plank where the head rests drops to the table. This is because the blood rushes to the head."

"When the pupil is given a difficult problem to solve, the blood rushes to his head causing the balance to be upset and that end to go down. The blood rushes to the head to supply energy. Thus thinking is work."

"The person seems to tip back and fourth just a very little bit." Due to breathing. "Then when the person seems to have the answer the board becomes top heavy. Thats caused by the blood running to the head."

"Yes, thinking is work. When a person is given a mental problem



the blood rushes to the brain to fill the need for digested food and oxygen. Thus the weight of the head is greater and the plank goes down,--so we may tell that thinking is work."

Item 30. "Father: eyes, nose, chin; Mother: mouth, hands, lips; Grandparents: ear, character, teeth temper; hair unknown."

"Mother: brown eyes, sensitive, complexion, weak eyes, shape of teeth, curly hair; Father: dark, coarse hair, shape of hand and foot, long arms and legs, large bones, fairly tall, excitable, disposition, curly hair; Grandparents: facial features, fleshy."

"Mother: hair, feet, disposition, eyes, teeth, nose; Father: music, hands, growth, fingernails, writing and neatness, drawing; Grandparents: growth, music, eyes, ears, drawing, weight."

"Mother: dark eyes, long fingers, shape of fingernails, love of books, type of lips, long face, small bones; Father: brown hair, love of excitement, love of sports, dark complexion, brown eyes, pug nose, love of water, strong eyes, like of math; Grandparents: love of outdoors and outdoor life, quick temper (easily aroused but quickly forgotten), complexion, absent mindedness."

"Father: blond hair, blue eyes, freckles, height, hard teeth, pale complexion; Mother: long fingers, disposition, musical ability, tendency to argue, nervousness, large hands; Grandparents: large nose, poor eyesight, large mouth, large feet."

"Father: temper, hands, build, nose, mouth, love of sports, love of games; Mother: humor, love of music, acting, feet, hair; Grandparents: fingernails, honesty, ears."





"Father: quick temper, bad disposition, facial features, body is built like him, my hands are shaped like his, my hair is the same shade as his used to be; Mother: sewing ability, brown eyes, shape of my teeth, poor eyesight, cooking ability; Grandparents: dimples like great-grandfather, ears like grandpa's, wavy hair like my grandmother's, musical ability from grandpa and great-grandmother."

"Mother: hair, nose, complexion, ears, eyes; Father: disposition, eyes, high arch in feet, shape of face, fingers; Grandparents: fondness of sweets from my grandmother, eyebrows from grandfather, hands from grandmother, height, eyes."

"Mother: hair, eyes, long arms, hands, teeth, good in spelling, not too good in math; Father: nose, ears, plain handwriting; Grandparents: feeling sorry for myself."

"Mother: need for glasses, hazel eyes, style of penmanship, liking for English, dislike for some meats, long fingers, fondness for animals, long, slim feet, stage fright; Father: shape of jaw, liking for math, though milder, large ears, long fingers, musical ability, medium height, fondness for animals, shape of mouth; Grandparents: red hair, hot temper, excitability, musical ability, low voice, fondness for animals, large spaces between teeth, pug nose."

Item 31. Remember. "Blowing bubbles at a Sunday School party. Age 4. Playing with a rag doll. Age 4. After looking at Santa Claus whiskers I said 'Can you eat?' Age 5."

"Using the head of a bed for a trapeze. Age 3. I remember getting lost in M. and telling a policeman that I lived on S. St. Age 4.



Being tied to the tree but I don't remember what for. Age 3. Wandered off with my brother. Age 5."

"Taking afternoon walk with Mother--3. Hiding strap--4. Watching men dig--4. Biting spoon as I ate ice-cream--3. Listening for Dad--3. In flour garden--3. Falling downstairs-- $2\frac{1}{2}$ . Eating just frosting--4. Playing in sawdust--3. Winding in swing--4. Frightened of horse--4. Jumping off platform into snow--4. Unforbiddenly playing in henhouse--3. Visiting in S.--3. Crawling in bed with parents--4. Getting into neighbor's homemade ice-cream--4."

"First remember seeing Christmas tree at age of 2 years and feeling awed by it. Remember being afraid when I became separated from my Aunt in a store although she was on the other side of the table over which I could not see and crying loudly. Age-- $2\frac{1}{2}$ . Remember my excitement when I first waded and paddled around in a large pond at age of three. Remember falling down stairs with a doll in each arm and the excitement it caused at  $3\frac{1}{2}$  years. Remember making a snowman and becoming angry when my Aunt insisted I should stop and have my picture taken.  $2\frac{1}{2}$  yrs. Remember my first sled ride and running into a tree and thinking what fun it was. Age  $3\frac{1}{2}$  years. Remember scraping my feet on a new dining room table and stopping when I saw the looks passed my way-- $3\frac{1}{2}$ ."

"At  $3\frac{1}{2}$  yrs. I learned to ride a bicycle. At  $2\frac{1}{2}$  yrs. I learned to ride a ski-sled. At 3 yrs. I learned to wash clothes. While doing this one day I ran my arm through the wringer as far as my wrist. I have been afraid of the machine ever since. At  $3\frac{1}{2}$  yrs. I learned to iron. I burned my arm so severely that I have disliked to iron even today. At





$1\frac{3}{4}$  I learned to wash dishes; I broke four so my mother wouldn't let me wash until I was  $3\frac{1}{2}$  yrs."

"Write the figure eight--3 years. Write name--4 years. Go shopping with mother--2 years. Look forward to weekly box of chocolates from Grandpa--2 years. Cut doll's dresses out of new pair of curtains--4 years. Tied shoes-- $3\frac{1}{2}$  years. Cut hair--3 years. Fondness for playing with Grandpa's shoestrings-- $1\frac{1}{2}$  years. Refusing to go to school--5 years."

"Tie my shoes--4. Wash--6. Fight--4. Play cowboys--6. Swear--6, I think."

"After paddling in tub, ran around door yard without diapers, aged 26 mos. Shelled peas on porch with grandpa, aged 26 mos. Falling in brook, taking lamb to drink, aged 3. Seeing fox on way to B. school with my brother and mother, aged 3. Waiting at the top of the hill for our wash-woman--aged 3. Remember when my sister first walked--aged 3."

"I banged my head on the floor when I was mad.  $1\frac{1}{2}$  yr. I tied my shoes. 3 yr. I washed myself. 2. I cleaned my teeth. 2 yr. I fed myself. 1 yr. I bit my fingernails. 2 yr. I got lost in the city one day.  $3\frac{1}{2}$  yr. I played with the roosters. 3 yr. I stayed out in the barn and played with calves. 4 yr. I took off my clothes in the swing beside the road. 2 yr. My parents couldn't find me and they thought I had drowned. They found me playing in the sink. 2 yr. My father tried to spank me and I ran off and he couldn't catch me. 2 yr."

"Picked flowers at  $2\frac{1}{2}$  years. Rode tricycle and car at three. Learned to tie my shoe strings at three. Rode horse back at three. Picked blueberries at four. Say nursery rhymes at three. Talk on



telephone at three and a half. Caught shiners [shiners] at five in the river. Played ball at five. Learned to swim at five. Played with my cart and automobile six. Learned how fish at for real fish at seven. Made top for row boat at eight."

Item 31. Inheritance. "I am able to enter all kinds of sports on account of the strong body which I inherited. If I were taller than I am I would have a better chance to play basketball when the team which we are playing is tall."

"Am able to participate in all sports because of a fairly healthy body. Am not in need of glasses because my eyes are good. Am at a disadvantage in some things because I am fairly short. Am forced to go to the dentist's often because of poor teeth. Am forced to stuff myself when I am playing basketball to keep my weight from being too low. Must wear certain size clothes to fit. Weak ankles necessitate wearing of supports during strenuous sports."

"Because of my height, I can't be an Air Hostess, also my waist is so long sweaters and dresses do not fit me so well. My fingers are very long and gloves do not fit me as they should. Because I used to bite my nails, my hands aren't nice-looking."

"Poor eyesight so I don't play basketball. Liking for winter sports because of tallness and long legs. Long arms so I can play violin, also ear for music."

"I am short and too plumb (to play sports that are very fast). I am short and stocky that is a help because I don't get hurt very bad when I play rough games."



"Can't sing very well because my tongue is not adapted to it.  
Can't sew on fine stuff for long because of my eyes. Can be active in sports because of my strong heart and lungs."

"I have an inferiority complex from being so tall. I ought to be good in sports because of my build and height. I have long fingers and large hands which help in my piano-playing. My height helps me wear clothes to advantage."

"Can't run because I have a weak heart. I enter into most sports because my folks did. I am not an A student in school, because my folks weren't. I have learned how to do certain kinds of work, through adapting part of it; from my folks."

"Have tendency to dodge crowds. Have tendency to be taken advantage of by not saying no. Will take chances on things just for the adventure of it."

Item 31. Environment. "I am able to go swimming, skating, skiing, and playing tennis because the environment and climate are suitable for such sports. We must wear different kinds of clothing which are suitable to the climate."

"I sometimes lose my temper because of my three sisters. If I did not have them I probably wouldn't be so apt to lose my temper as much."

"Drilled in music because my parents and grandparents were musical. Brought up not to steal or kill, so these ideas aren't inclined to enter my mind. Brought up to like the water and go in for swimming."

"The boys are a clean bunch of boys or as clean in mind as you can expect from boys. Everybody knows each other. There isn't any gang



The first part of the paper is devoted to a general discussion of the problem of the origin of life. It is shown that the problem is not only a scientific one, but also a philosophical one. The scientific aspect of the problem is concerned with the question of how life arose from non-life. The philosophical aspect is concerned with the question of whether life is a necessary part of the universe or whether it is a mere accident. The paper then proceeds to a discussion of the various theories of the origin of life. It is shown that the most plausible theory is that life arose from non-life through a series of chemical reactions. This theory is supported by the discovery of the first fossilized micro-organisms, which are believed to be the earliest forms of life. The paper concludes by stating that the origin of life is a problem that has fascinated mankind for centuries, and that it is one that will continue to fascinate us for many years to come.

warfare such as there is in the big cities. All in all I think I live in a wonderful environment."

"My love for animals and flowers come from being able to take long walks in the woods and fields. I have some ability in skating and skiing from living near hills and a pond. My fondness of clumbing and being a tomboy is because there are no close neighbors and lots of places to climb."

"Can skate well because I have lived for a number of years beside a pond. Can ski because of living where there are hills and snow. My environment enables me to progress in my search of knowledge."

Item 31. Changing behavior. "From what I have learned I believe that human behavior can be changed but sometimes it is harder than others. A change in environment is one of the easiest ways of changing human behavior. The people which you go around with have a lot to do with the way a person behaves."

"Environment has a lot to do with changing behavior. If you want to change your nature and make new habits that changes your nature also. When you mature in mind your nature tends to change and 'grow up.'"

"This item seems to prove that my behavior has changed radically over a period of several years. It also seems to point out that the physique I inherited and my environment play a large part in the changing of my behavior. My family, the people I meet every day or only once in a while, my school, camp, and many other things along with my own personality have been important influences in the changing of my behavior."

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"Behavior may be changed; but it is difficult once it becomes a habit. Behavior can be changed gradually by meeting new situations people, and sometimes by a sudden shock or awakening."

"Behavior may be changed by bettering oneself physically, by bettering environment and by the efforts of the individual to form new and better habits to replace the old ones. Therefore I believe from what I have learned that behavior can be changed. However, I don't think it is as simple to change a person's morals."

Item 32. "Habit plays the most important part in a New England Thanksgiving. You might reason that if you don't eat much before Thanksgiving you can eat more then. Hunger is experienced before eating dinner and afterwards, satisfaction is experienced.

"At Revere Beach, habit would play little or no part. It would be an entirely different experience than ever experienced before. Reason would play a small part, but important. In a place like Revere Beach your emotions are given free play. You act as you never have before. Some emotions must be controlled, because there are many opportunities in which your emotions given free play, may lead you into trouble. Reason would help in determining the right or wrong thing to do."

"At Thanksgiving time in New England people are rushing around, thinking of the dinner, the entertainment, and other various things. The entire celebration is probably a habit, as are most customs. Habit plays a part again while the dinner is being prepared, and generally the whole plan of the day is a repetition of the last year's Thanksgiving Day. Reason must be used to make plans for the day's





entertainment and the meals; and everyone can't seem to help being happy over the excitement of things, (emotion). Probably emotion was given more play in the olden days, however, because then the people went to church and spent the entire day in worshipping and giving thanks. Another emotion which probably takes place, nowadays, is worry, especially done by mother who is in the kitchen fixing the turkey.

"Mardi Gras, the holiday set aside by Europeans originally, but celebrated in this country by the people of the southern cities, such as New Orleans, takes place on the Tuesday before Ash Wednesday. The holidays actually start on the twelfth night after Christmas Day and the climax comes on the day before the start of Lent. Mardi Gras is often and appropriately called 'Fat Tuesday' because, it is said, that this day was set aside as a time for feasting, so that every bit of meat and other foods, forbidden to be eaten during Lent, would be all eaten up and would not spoil. In our times, Mardi Gras is celebrated by large parades, and a carnival in which all are dressed in costumes. I think that at this time emotion is more important than reason or habit. No one could help feeling gay and happy at this time. In the ancient times, this day was used more as a time for confessing one's sins before Lent, and emotions probably were not so important. Habits are used in preparing for the celebration, the same, practically, as at Thanksgiving time in the North. Reason is used when plans are made and also in the choosing of costumes.

"I think that emotion, reason, and habit are very important on both these holidays."

"Thanksgiving is a day when we should display the emotions of



security, love for relatives and country, and general happiness over the whole celebration. Modern Thanksgiving is morely a meeting of the family as a sort of re-union, rather than for thankfullnes for everything in general, as it was when first celebrated years ago.

"An evening at Canobie Lake is a care-free time in which we get away from it all and have a great time for several hours. The emotions of excitement, fear, and joy are aroused there, especially on the roller coaster.

"In both of these situations, habits, emotion, and reason, are used. The habits come automatically and we hardly realize their presence in our behavior. Our emotions make us aware of our surroundings to which we react to in several ways. Reason also enters the picture. We realize we do not meet very often so celebrate while we are together. These are very important as they are the controlling factors of our behavior."

"New England Thanksgiving: Habits: Eating a large meal. Going to my Aunt's. Emotions: Excitement. Delight. Reasons: Looking forward to seeing friends, having a good meal, good trip, good time. Thinking of going home when the day ends. Evening at Revere Beach: Habits: Getting ready to go. Emotions: Delight. Excitement. Anger (in a way, because you have to go home). Joy. Reasons: Looking forward to going, and having a good time. Thinking of the things I was going to do. Thinking of going home as the day ends."

"Here in the north one of our largest Halerdays is Thanksgiving on which we feast and or should pray. so that on the whole we have more or less of a Conservertive Halerday. In the south at the City of New Orelans

The first part of the paper is devoted to a general discussion of the problem. It is shown that the problem is of great importance in the theory of the structure of the atom. The second part is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the structure of the atom. The third part is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the structure of the atom.

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they have in the spring a Halerday which is called the Madri Gras in which the people dress in coustume, Have parades, dance in the streets and for several days let themselves go and have a good time nothing of which is at all Conservertive. Thanksgiving on one hand is somewhat Conservertive where as on the other hand the Madri Gras is vary liberal. Here in the north I think it is more our way and Habit to be Conservertive and restrantive of our emotions whereas in the south they have a tendince to be liberal by Habit and to let them selves go. It is affon said that Northerns never let themselfs go, maybe this is true, I know that most of the southernns I have known do let themselves go more than we do here in the north Why this is I do not know so I will leave the reader to draw his one Conclusions."

"The New England Thanksgiving has a lot more to it, than an evening at Canobie Lake. At Thanksgiving there is a tradition behind it. And at Thanksgiving we have a big dinner and a lot people for dinner. We all eat very much and after were done eating, most of the men folks sleep it off. While the women folks do the dishes.

"But at Canobie Lake we go to have a good time and spend a lot of money."

"Thanksgiving day dawned bright and clear. All of my attention was focused on the dinner. At dinner we said grace and started to eat. After dinner we sat around and talked or snoozed. After a while I went out; over to P's, then I came home.

"This day was one of the hottest all summer. In the afternoon my uncle and myself started for Nantasket I was so excited and thrilled that





I couldn't stand still. When we arrived at Nantasket I went on practically everything there. All the time I was very excited and having a grand time too. I was also very happy. When I got to my Uncle's house that night I was so tired that I went right to sleep after telling my aunt about the trip.

"I was content Thanksgiving day and even happy. I was even happier and more excited when I went to Nantasket. Reading this article over I come to the conclusion that there must be several different kinds of happiness. On Thanksgiving day I had a grateful, contented happiness, or rather I felt that way. When going to Nantasket I felt excited and wanted to be in every place at once. On Thanksgiving it might have been the thing that it represented that made it such a quite day."

"Habits of speaking, gestures, and other habits along this line would probably play an equally important part in both a New England Thanksgiving and an evening at Revere Beach. These habits would be done unconsciously regardless of the situation. At a New England Thanksgiving habits of courtesy and table manners would probably be very prominent. In an evening at Revere probably the habits of either saving money or spending it would come to the front.

"Emotions would play a large part in the behavior of a person at either place. Of course the important emotions would be very different. At Thanksgiving at the first of the meal there would be a quite solemn time when the emotions of thankfulness and sadness or maybe happiness would be important. After that joyfulness, happiness, gratefulness, and perhaps excitement would play an important part. In an evening at



Revere, the most important emotion would be excitement. While riding on the roller coaster fear might be present and at other times jolliness and happiness. Of course there would be sadness too when it was time to come home.

"At Revere, reason would be employed in the spending of money. It would be necessary to realize just how much money you had to spend, where to spend it and have the most fun, and which things were safe. At a Thanksgiving dinner, reason would be important in judging how much to eat. Reason would also prompt you in the things you said and the things you helped with."

"Today Thanksgiving Day and the Mardi Gras are still holidays but our emotions toward them have changed because of the elapse of time between the first holiday and today. On these day we let our emotions rule us more than our habits and reason while on other days we control our emotions and let habit and reason rule us."

"The average New Englander at a Thanksgiving celebration has a moderate amount of emotion, a large amount of habit, and reason plays little or no part, as it does in practically all celebrations. Emotion is in the form of excitement and happiness, although in a milder form than in a Mardi Gras. Reason plays a very small part; weakly arguing that Thanksgiving comes every year, and is the same every year, and what is it anyway, but a big feed? But habit holds full sway. As it is almost the same each year, or at least follows the same general pattern, habit guides your behavior for the most part.

"A Mardi Gras, however, is different. Here emotions play the leading

the first of these is the fact that the  
the second is the fact that the  
the third is the fact that the

the fourth is the fact that the  
the fifth is the fact that the  
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part, with habit having force according to the number of times the individual has been to this celebration. Here, also, reason is very insignificant; only entering the picture when a question of some importance is to be decided, such as,--should I waste any more money on this foolishness, or should I have one good time and go home with so much more zest for living? Habit, of course, does not enter the picture unless you attend a Mardi Gras each season and your behavior there is taking on rather a fixed pattern. And so, emotion rules the roost. Excitement, joy; occasionally, fear, anxiety, and repentance, are the principal emotions.

"And so, here are these two totally different celebrations, occurring in the same race, year, and country. And what makes them so different? Habit. The Mardi Gras was brought over from Europe where people work hard and play hard. The Thanksgiving custom, also, came from Europeans; but they were in a totally different humor, environment, and situation. So much for their origin. They're meaning now, is a custom, a habit. Things are now the same in New Orleans and in New England, fundamentally. But the difference in their celebration is purely habit and custom."

Item 33. "After finishing this unit there are several things I could change in my behavior, from what I have studied and learned. It would be better if I didn't get angry as quickly over trivial matters. A little more ambition would help me do more homework. It would also be advantageous if I carried through one idea before changing to another."

"I would like to have better control over my temper. I would like



to form the habit of not wasting time. I would like to talk slower. I would like to be able to express myself better. I would like to be calmer in exciting situations. I would like to be able to put all worries from my mind. I would like to be able to remember past things better. I would like to be more sensible and not be always thinking of fantastic ideas."

The author advised the pupil not to curb the imagination.

"I would like to improve my handwriting. I would like to be better in all sports. I would like to be always good natured."

"From what I know and believe about behavior I would like to change the way in which I do my studies so as to get better marks. I know I can't be 100 % but there is a limit."

"First and most important, to me, is to be able to control my temper. I think that my temper has gotten me into more trouble than anything else. When I get home from basketball, my family can hardly live with me. Whatever they say, I snap back with some remark and get so mad that sometimes I throw things, pull my hair or cry. Very often I am ashamed of myself afterwards.

"I should also like to be able to 'forgive and forget and not hold a grudge against a person. I have lost friends by building up such a grudge against a certain person, that I say hateful and sarcastic remarks against that person whenever his name is mentionned.

"One of my faults is worry too much over nothing, and building up a mere trifle to a looming mountain.

"I shall always be willing to admit I can't do a thing. Such as the

1. The first part of the paper is devoted to a general discussion of the problem of the existence of solutions of the system of equations (1) for arbitrary values of the parameters  $\alpha$  and  $\beta$ . It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if and only if the condition  $\alpha + \beta > 0$  is satisfied.

2. In the second part of the paper the problem of the existence of solutions of the system of equations (1) for arbitrary values of the parameters  $\alpha$  and  $\beta$  is solved. It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if and only if the condition  $\alpha + \beta > 0$  is satisfied.

3. In the third part of the paper the problem of the existence of solutions of the system of equations (1) for arbitrary values of the parameters  $\alpha$  and  $\beta$  is solved. It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if and only if the condition  $\alpha + \beta > 0$  is satisfied.

4. In the fourth part of the paper the problem of the existence of solutions of the system of equations (1) for arbitrary values of the parameters  $\alpha$  and  $\beta$  is solved. It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if and only if the condition  $\alpha + \beta > 0$  is satisfied.

5. In the fifth part of the paper the problem of the existence of solutions of the system of equations (1) for arbitrary values of the parameters  $\alpha$  and  $\beta$  is solved. It is shown that the system has solutions for all values of the parameters  $\alpha$  and  $\beta$  if and only if the condition  $\alpha + \beta > 0$  is satisfied.

play I'm now supposed to be in."

"From what I know now now I do not want to change myself too much, maybe I am conseated I do not know, but I would like to keep out of a rutt also I hope to get and keep a good Humar, to keep from being Con-ceated, not to be too sentermentl but still not hard and cold, I want to keep from worreying too much, I want to keep from forming bad habits, also I want to keep from getting run down. Maybe I can become a better fellow here after at least I can try."

"The first thing I would like to change about my behavior is to make friends more quickly. It takes me a long time to get acquainted. Then I would like to change my behavior in not being so backward in doing things such as in school activities."

"The one thing that I would like to change most in my behavior is to stop biting my fingernails. All the attempts that I have made so far have failed. I think that I can stop biting them and I have learned things in this work that will help me.

"I would also like to change my behavior as far as picking on smaller kids is concerned. I have a tendency to do this and I think that I would be just as well off if I didn't do this.

"I would also like to be able to control my emotions in school. When someone does something funny I start laughing and then I get the dickens for it. I think it would be very beneficial if I could."

"I would like to stop smoking; I would like to have more ambition to do my school work; I don't want to waste my time on school work; I think that if I could get a job that I would like it would change my



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behavior."

"I'd like to change my behavior in the following ways: (1) not to bite my nails, (2) stand straighter, (3) getting up earlier, (4) study my subjects longer."

"The most important thing that I would like to change is my temper. It does me no good to get so mad and it is always getting me into trouble.

"I would also like to be able to sing well.

"Another thing that I would like to stop is my habit of rubbing my nose with my little finger when I'm thinking.

"Another habit I would want to change is twisting a strand of my hair when there is nothing else to do with my hands.

"I had a bad habit of always cracking my gum. I have almost completely stopped this.

"One of my silliest faults is that of always picking arguments over nothing.

"I would like to be a good artist and to be able to speak in public without getting almost sick.

"Another way in which I would like to change is that I'm always doing things on impulse, which with my temper gets me into still more trouble.

"Then I would like to be able to stop thinking of how I am ever going to do all my work etc."

"From what I now know and believe, the following are things which I would like to change in my behavior: 1. I would like to get rid of



my nervous habits, for example, biting my fingernails; and, I think that once I did this I would lose my habit of self-consciousness. 2. I would like to cultivate a more pleasing personality and look at things more as an optimist, instead of letting my pessimistic side of perception, and worry get the best of me. 3. I would like to break myself of saying mean things and getting disagreeable and in a temper so easily. 4. Lastly, I would like to become more alert to the things happening around me, so that they would seem more interesting and enjoyable."

"I would like to change my emotion of anger to disgust or some other emotion. If anything gets me mad it's the loss of temper or letting your emotion of anger run away from your control. If I can't control my temper any better than I do sometimes I don't think I will be a very successful vet. If I got mad at an animal that I was going to operate on I might be so mad I'd just let the knife slip and there would be one less animal in that category. I don't think an incident like that would take place but something similar might."

"From what I now know about behavior I would like to change quite a few things about my behavior. First: I would like to change my temper. I am altogether too quick-tempered; and although I am aware of this, and try to curb it, it seems to be the same each time something annoys me. Secondly: I would like to have more inhibitions,--I talk too much. Thirdly and lastly; I would keep my mind on my own business, and not get to wondering where M. S. is tonight or what she is doing."

Item 36. "I think that I learned a great deal of things out of this unit. I probably would have had like it a lot better if I had had studied





a little more."

"This unit made me stop and think. It refreshed my mind on my baby-hood days. I learned the importance of intelligent behavior. The ways in which perception, heredity, and environment affect our behavior. Some of the important parts of the ear and eye."

"I really think that this unit was the most interesting of all we have studied so far this year. Naturally I learned many new things, a lot of which I will doubtless forget but others I am sure I will remember. The part which was most interesting to me was the part on the nervous system and the sense organs. Learning the causes and controls of human behavior was also valuable information. Many sections of the unit explained things I had often wondered about such as what part habits play in our behavior and why we do certain things. It was also interesting to read about hypnotism and the 'murder scene' was worth taking the course for."

"1. I know a lot more about behavior than I did when we started the unit. 2. The unit was very interesting and I enjoyed it. 3. The experiments have taught me quite a few things. 4. I have learned about a lot of things I didn't know about before such as the nervous system. 5. I had a lot of fun doing some of the things and others I had a terrible time with."

"I learned quite a lot about behavior, especially intelligent behavior; about tropisms; phototropism in house plants; Venus fly trap; Nervous System; different parts of the body; patellar reflex; conditioned reflexes; inborn reflexes; skin giving exact temperatures; where

The first part of the paper discusses the importance of the study and the objectives of the research. It then proceeds to a literature review, where the author examines previous studies on the topic. The methodology section follows, detailing the research design and data collection methods. The results section presents the findings of the study, and the conclusion summarizes the main points and offers suggestions for future research.

The second part of the paper focuses on the analysis of the data and the interpretation of the results. It discusses the statistical methods used and the significance of the findings. The author also addresses the limitations of the study and provides a final conclusion. The paper is well-structured and provides a comprehensive overview of the research topic.

you taste different things on the tongue; Ear; Eye; negative after-image; color contrast; perception; and physical and mental traits. In all of these things that I have mentioned, I didn't learn half of what I could have, if I had been interested in the things; but I got something out of the unit. If it had been something I had liked I would have spent more time on it and would get more out of it. The next unit sounds interesting so perhaps I will do better on that."

"1. The unit helped me understand other people better because now I see the real cause for behaving the way we do. 2. Now I realize the importance of holidays, etc. because it is sometimes good to let the emotions have full play. 3. I think that I can reason things out better now that I have a viewpoint on the behavior of things. 4. I learned about hypnotism, spiritualism, and sixth sense, things which I have always considered interesting. 5. I found out why people sometimes get in a rut and I think I would know how to take precautions against getting into one myself in later years."

"I have learned about glands, tropisms, Habit, Emotions, Drives, How to study better, How to controll myself better also a greater understanding of my self. I learned about my sences, and how my sences react, the power of Habit, the advantages and Disadvantages of Instincve behavior and intelagent actions, all of these things will help me to understand behavior with which I can controol myself better on top of that I though that this unit was vary interesting and likeable. All in all I that this unit was all right but I do not like Contract work and think this unit would be better without a contract."



"When I took the first test on behavior, my answers were for the most part all guesses. Every question seemed complicated and far above me. In fact, all it seemed very uninteresting.

"Later in the unit, I absorbed a few of the less complicated details and then memorized the rest when I knew that a quiz was coming. Some of the items and experiments didn't make much sense but the facts that they proved were perfectly logical.

"I did all the required work and then began to wonder what I would do on a test. When the final test was passed out, I was eager to see if I really had learned anything. I had; most of the questions made sense and I could understand them a great deal better than before.

"The first thing I learned was what behavior really is.

"The experiment on phototropism made me understand more about why plants turn toward the light.

"I learned the most when we studied hormones. I had heard vaguely of adrenalin, insulin, the pituitary gland, and something of goiters. Now these have taken a more definite shape in my mind.

"The study of the nervous system was a bit harder to understand and I didn't get very much out of it. I did learn some new things about the brain, however. The types of behavior and their definitions were finally made clear to me.

"One of the most amazing things I learned was that we tasted most flavors with a part of our noses. The flavors we taste on our tongue are sour, bitter, sweet, and salt. Another thing I learned was that there is a blind spot in each eye and that one of every person's eyes is





dominant.

"The discussion on intelligent behavior and instinctive behavior taught me quite a bit. The discussion on emotions did not teach me so very much but the last discussion on hypnotism was very interesting especially with the articles that gave examples.

"The four column paper Item 31 was one of the most interesting papers that we had to do. Another one I liked was the one on our inherited traits. Another one I especially liked was the paper on the behavior of a certain plant, and lastly I like the idea of summing up what I really have learned."

"Definition and controlling factors of behavior. Parts of ears and eyes. The two types of nervous system and their operations."

"I found this unit quite valuable and interesting particularly the point that 'all the things a living thing does whether controlable or uncontrollable is a part of behavior.' This was the basic and outstanding point of the unit among many. Through this unit I learned new words and meanings and also a wider course of testing and judging ones mentality.

"I think the unit study of behavior is especially valuable in teaching and impressing facts of human nature from the psychological point of view. And thus proves various psychological points."

"1. Learned about plant behavior and this helped me solve some of the things I have wondered about. 2. Learned about the nervous system and the brain. 3. Learned about conditioned and inborn reflexes. 4. Learned about habits and how to form and break them. 5. Learned about the sense organs. 6. Learned about instinctive and intelligent behavior

The first part of the paper discusses the importance of the  
theoretical framework in the study of the  
phenomenon. It is argued that the theoretical framework  
should be based on a clear understanding of the  
phenomenon and the research objectives. The second part  
of the paper discusses the methodological approach used in the  
study. It is argued that the methodological approach should be  
based on a clear understanding of the phenomenon and the  
research objectives. The third part of the paper discusses the  
results of the study. It is argued that the results of the study  
should be based on a clear understanding of the phenomenon and  
the research objectives. The fourth part of the paper discusses  
the conclusions of the study. It is argued that the conclusions of  
the study should be based on a clear understanding of the  
phenomenon and the research objectives. The fifth part of the  
paper discusses the implications of the study. It is argued that  
the implications of the study should be based on a clear  
understanding of the phenomenon and the research objectives.

and the advantages and disadvantages of it. 7. Learned about emotions and how to control them."

"I want to be a vet as you probably know. I liked this unit in a number of different ways. I think that what I have learned in this unit will help me all through life.

"In one way I liked the unit because we didn't dwell on anyone experiment or talk very long on it. I liked also the way discussions went off. They were very interesting.

"I learned more about the human emotions and intelligent than I have ever know before. I also learned an awful lot about behavior. I liked the way you would split up the lectures and discussions. I think that this unit will be the best we will have this year. In later life and even now I will use the things that we learned in this unit today. When I see somebody get mad and 'let go' I know why they do it. I also understand the nervous system of man and how it works. I think the greatest thing I learned was that the teacher isn't such a 'bad egg' after all. It is only his emotions that start him off wrong on some mornings."

"I enjoyed this unit and found it more interesting than anything we've studied so far.

"I learned quite a bit about how the human system is made, and what makes us behave as we do. Plant behavior is as interesting, if not more so than animal behavior. In my report on the sundew, I learned many things I had not even heard of before.

"I learned a lot about myself and the habits I had. One of the best things is that I have learned to control my temper, if I remember





it in time.

"I learned about the eye and about the ear. I never knew there was a blind spot in the eye before.

"I learned a lot of things I had inherited from my mother, father, and grandparents.

"I learned what habit, reason, emotion, inhibition, drives and reflexes mean and an example of each.

"It is hard to say in so many words just what I have learned. But, I'm sure I have learned as much as was expected of me. Or almost as much."

"1. I knew that plants would turn toward light but I didn't know that plants would turn toward or away from heat, gravity, contact, chemicals, and water. 2. I learned about hormones and a lot about the nervous system. Animals have a ladder type nervous system. The two main parts of the nervous system we have are the central nervous system and the automatic nervous system. The nervous system is quite complicated. 3. Inborn and conditioned reflexes are quite interesting. An inborn reflex is a quick, unlearned action; a conditioned reflex is a learned reflex. I learned about the other types of behavior, too. 4. The experiments about taste and feeling were quite interesting and I learned a little about them. It is interesting to know that you taste sweet things most on the front of the tongue, sour on the sides, bitter on back, and salt all over. 5. I learned quite a bit from your lectures and the experiments on the eye and the ear. The diagrams of each are good and have the important parts. 6. When we studied the disadvantages and advantages of instinctive

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and intelligent behavior I learned what the conditions of living would be if we had instinctive behavior. I think each has good advantages so if you had your choice you have a tough time. 7. I think the last thing we studied was the most interesting; about hypnotism, spiritualism, and what makes a person go crazy. I learned a lot about all of them, because it was interesting. 8. The way we are going over the things now we review them and are less apt to forget them. It is a good way to learn them and I got a lot out the subject 'Ways of learning.'"

"1. I obtained a knowledge, or at least the urge to know of queer plants, such as the bladderwort, and Venus' fly trap. 2. During the study of habits I began to think of my own bad ones, and succeeded in breaking one; namely, chewing the skin around my finger-nails. 3. I learned about the senses. These in themselves are values, but of course we were expected to learn that anyway, but I am sure that a knowledge of these things will be useful in the future. 4. In the study of perception, I realized that it is not only how closely you watch things that counts; it is the way that you connect these things with things in your mind. 5. I also learned what a great effect physique and environment has on behavior and I will not be too quick to judge a person by his actions, knowing that he may be acting according to one of these factors. 6. In general, this study has taught me to reason and think along unbiased lines, and to try to see below the surface of things."



### Weaknesses Discovered in the Unit

Defects in instruction.-- Teachers tend to teach too much detail and to be "over the heads" of the pupils. These defects are sometimes due to lack of thorough organization of the material and to an uninteresting method of presentation. The author has felt that his organization and presentation of some of the unit materials was too logical and insufficiently psychological, resulting in less pupil interest and poorer mastery; at times he has wondered if he were going into too much detail. On the whole, however, the organization and presentation of the unit have produced results superior to those ordinarily obtained, and one should not oversimplify in an effort to be more interesting.

Specifically, the major test (pre-test and final test) needs further revision. Of 255 choices, 37 need to be changed. Of 57 items, 6, 32, 34, 35, 47, 48, 50, 53, and 55 should either be revised so as more truly to test the ability of pupils to apply what they have learned, omitted from the test, or be taught in the unit procedure. Items 27 and 38 are somewhat controversial. The teaching bearing on items 3, 9, 10, 11, 12, 13, 14, 15, 18, 19, 21, 23, 25, 26, 39, 40, and 43 (details on nervous systems and types of behavior) needs to be strengthened. Items 33, 49, and 51 need to be revised, as they seem to present difficulties to the brighter pupils not apparent to the poorer ones.

Defects in organization.-- As might be expected, there is some objection to the "contract" plan. A more general criticism was of the amount of required written material. A few did not care for the color scheme tried (see Appendix E). The unit is a bit long, and it might be



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argued that the physical basis of behavior could be included in a preliminary unit on human physiology. The numbering of the 60 required activities, the 36 written items, and the 15 experiments caused some confusion at times to some pupils. For example, activity 29 was experiment 19 and item 18, while activity 36 was experiment 23 and item 24. The numbering should be revised, probably on the basis of the written items, numbering the activities to correspond and including several as separate paragraphs under each number. These paragraphs might be lettered if desired. The experiment numbers would be left as they are, as they might start with 11 or 22 instead of 13 another year. The number of written items required might be reduced, leaving more of them to the pupil's judgment as, for example, was done with activity 23 and the lectures. Most of the pupils saved notes on all eight lectures, both moving pictures, and some of the other activities, making a total of over 50 papers. One reason for requiring 36 written items was to have more concrete material available for an evaluation of the unit, although this number represents a carefully selected minimum.

There was not enough time for the optional, related activities. Most of the pupils were too busy, as most Americans are, to have time to do good work on their various subjects, and this fact, plus the amount of required, minimum activities to be done in the time available, reduced the amount of optional work that might otherwise have been done. For example, given more time a voodoo session would have been run off, another "dramatic stunt" tried, and several optional activities and reports that were started would have been completed.



### Summary of Findings and Conclusions

The unit.-- The major idea of the unit was absorbed by the pupils. Most of the detailed facts and ideas required in the unit were mastered and understood by a majority of the class, and produced desirable changes in the attitude and actions of some pupils.

The unit assignment.-- The materials and organization of the unit assignment are fundamentally sound. A change and/or increase in emphasis on details of the nervous system and of behavior, a simplification of the organization, and a reduction in the amount of required written work are indicated.

A final statement.-- Experience in evaluating a unit on behavior in tenth-grade biology indicates that such material can be taught at that grade level and is both interesting and of considerable practical value to pupils.





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THE HISTORY OF THE

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The second part of the paper is devoted to a discussion of the various theories which have been advanced to explain the origin of life. These theories are: the theory of spontaneous generation, the theory of biogenesis, the theory of abiogenesis, and the theory of panspermia. Each of these theories is discussed in detail, and the evidence for and against each is presented.

The third part of the paper is devoted to a discussion of the various experiments which have been conducted to test the various theories. These experiments are: the experiment of spontaneous generation, the experiment of biogenesis, the experiment of abiogenesis, and the experiment of panspermia. Each of these experiments is discussed in detail, and the results are presented.

The fourth part of the paper is devoted to a discussion of the various conclusions which have been reached by the various scientists who have studied the problem of the origin of life. These conclusions are: the conclusion that life is not spontaneous, the conclusion that life is not biogenic, the conclusion that life is not abiogenic, and the conclusion that life is not panspermic.

The fifth part of the paper is devoted to a discussion of the various problems which remain to be solved in the study of the origin of life. These problems are: the problem of the origin of the first living organisms, the problem of the origin of the first cells, the problem of the origin of the first molecules, and the problem of the origin of the first atoms.

The sixth part of the paper is devoted to a discussion of the various methods which have been used to study the origin of life. These methods are: the method of spontaneous generation, the method of biogenesis, the method of abiogenesis, and the method of panspermia. Each of these methods is discussed in detail, and the results are presented.

The seventh part of the paper is devoted to a discussion of the various theories which have been advanced to explain the origin of life. These theories are: the theory of spontaneous generation, the theory of biogenesis, the theory of abiogenesis, and the theory of panspermia. Each of these theories is discussed in detail, and the evidence for and against each is presented.

The eighth part of the paper is devoted to a discussion of the various experiments which have been conducted to test the various theories. These experiments are: the experiment of spontaneous generation, the experiment of biogenesis, the experiment of abiogenesis, and the experiment of panspermia. Each of these experiments is discussed in detail, and the results are presented.

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- Merrill, Frederick T., Marihuana, Opium Research Committee, Foreign Policy Association, Washington, D. C., 1938, 48 pp.  
Description, history, effects, control, and spread of the drug, and scientific tests.
- \*Miller, Lois M., "Marvels of Pain-Conquering Nerve Surgery," Reader's Digest (January, 1942), 40: 41-4.  
Delicate surgical operations to relieve pain.
- P. A., "I Have Everything," The Atlantic Monthly (July, 1939), 164: 102-3.  
Excellent proof of what you can do with your life, as a 22-year old girl shows.
- Patri, Angelo, White Patch, American Book Company, New York, 1911, vi + 216 pp.  
The world through an ant's eyes, revealing much of the life of social insects.
- Poncins, Cotran de, "Kabloona," Reader's Digest (June, 1941), 38: 141-68.  
A civilized Frenchman finds true happiness in simple, cooperative living with friends close to nature. Compare with Herold.
- Porter, Lawrence C., and Frank B. Lee, Stimulating the Growth of Plants by the Use of Artificial Light, General Electric Company, Cleveland, 1934, 65 pp.  
Technical but clear presentation of practical uses of artificial light with plants.
- "Psychology Professor Hypnotizes Student in Class Demonstration," Life (May 20, 1940), 8: 78-80.  
Compare with "Hypnotism."
- The Reader's Digest Twentieth Anniversary Anthology, The Reader's Digest Association, Pleasantville, New York, 1941, 123 pp.  
Articles starting on pp. 5, 8, 14, 48, 85, 104. Being alive, labor, personality, fears, environment, and prayer.

The first part of the paper discusses the importance of maintaining accurate records of all transactions. It is essential for the business to have a clear and concise record of all income and expenses. This will allow the business to track its financial performance over time and identify areas for improvement. The second part of the paper discusses the importance of maintaining accurate records of all assets and liabilities. This will allow the business to track its net worth over time and identify areas for improvement. The third part of the paper discusses the importance of maintaining accurate records of all debts and obligations. This will allow the business to track its financial obligations over time and identify areas for improvement. The fourth part of the paper discusses the importance of maintaining accurate records of all taxes and other legal obligations. This will allow the business to track its financial obligations over time and identify areas for improvement. The fifth part of the paper discusses the importance of maintaining accurate records of all other financial information. This will allow the business to track its financial performance over time and identify areas for improvement.

Rhine, J. B., New Frontiers of the Mind, Farrar and Rinehart, Inc., New York, 1937, 274 pp.

Duke University experiments in extra-sensory perception, or mental telepathy, seeming to indicate something to it.

\*Riis, Roger W., "Human Nature Has Changed," Reader's Digest (December, 1941), 39: 135-7.

Proofs of a growing sense of obligation to our fellows, and slow growth away from evil.

Root, A. I., and E. R. Root, The ABC and XYZ of Bee Culture, The A. I. Root Company, Medina, Ohio, 1908, 536 pp.

Perhaps the best book on bee-keeping.

de Rougemont, Denis, and Charlotte Muret, "A Lesson from the Swiss Army," Reader's Digest (October, 1941), 39: 49-52.

Value of personalization of army and making it part of the national life. Real democracy.

Rowell, E. A., and R. Rowell, On the Trail of Marihuana, Pacific Press Publishing Association, Mountain View, California, 1939, 96 pp.

Study of marihuana. Compare with Merrill.

\*Ruch, Floyd L., G. N. Mackenzie, and M. McClean, People Are Important, Scott, Foresman and Company, New York, 1941, xii + 283 pp.

Study of emotions, drives, social influences, personality, and general behavior.

Schriftgiesser, Karl, Families, Howell, Soskin, New York, 1940, 444 pp.  
Famous Americans and how they "happened."

Sheldon, H. Horton (Editor), The Progress of Science, The Grolier Society, Inc., New York, 1940, xii + 442 pp.

Selected topics bearing on behavior.

"'Sixth Sense' of Blind is Discovered to be Hearing," Life (June 30, 1941), 10: 49-50.

Hearing, not air pressure, used to "feel" approach to obstacles.

Smith, Ella T., Exploring Biology, Harcourt, Brace and Company, New York, xii + 696 pp.

Textbook reference on behavior, pp. 579-658.

Smith, Ella T., and Lynda M. Weber, A Guide to Modern Biology, Harcourt, Brace and Company, Inc., New York, 1941, viii + 324 pp.

Workbook reference on behavior, pp. 175-214.

Sondern, Frederic, Jr., "The Brainpower of Hitler's Army," Reader's Digest (July, 1941), 39: 7-12.

Modernize army or become obsolete. Dynamic change. Compare with Arnold, Collins, Lippmann.





"Spiritualism," Life (June 16, 1941), 10: 74-81.

Exposes physical, admits perhaps something to mental phenomena.  
Compare with Carrington, Jastrow, Stoker, Rhine, Walsh.

Stern, Edith M., "Our Ailing Mental Hospitals," Reader's Digest (August, 1941), 39: 66-9.

Need for better treatment of mental sickness.

Stockly, Walter, "Hooton of Harvard," Life (August 7, 1939), 7: 60-6.

Study of the famous criminologist-anthropologist and his views.

Stoker, Bram, Famous Imposters, Sturgis and Walton Company, New York, 1910, ix + 349 pp.

Spiritualistic fakirs. Compare with Jastrow.

Snyder, Emily E., Biology in the Making, McGraw-Hill Book Company, Inc., New York, 1940, xii + 539 pp.

Sections on tropisms, chemical messengers, reactions.

\*Taylor, Frank J., "Fitting the Worker to the Job," Reader's Digest (January, 1942), 40: 12-16.

Humm-Wadsworth temperament tests found best to fit workers to jobs.

Thompson, H. T., A. Mee, and J. H. Finley (Editors), The Book of Knowledge, The Grolier Society, Inc., 1940, 20 vol. and 2 supplements, viii + 7896 pp.

General reference. List of topics starting p. 7609.

\*Tomilson, S. S., "Hypnotism Grows Up," Esquire (January, 1942), 17: 84, 193.

Compare with "Hypnotism" and "Psychology."

Walsh, James J., Spiritualism--A Fake, The Stratford Company, Boston, 1925, 132 pp.

Compare with Carrington, Jastrow, "Spiritualism," Stoker, Rhine.

Wells, H. G., Men Like Gods, The Macmillan Company, New York, 1923, vii + 327 pp.

Imaginative story of race of supermen.

\_\_\_\_\_, Short Stories, Ernest Benn Limited, London, 1927, vi + 1148 pp.

Time Machine, Empire of the Ants, Country of the Blind. Print small.

\_\_\_\_\_, Star-Begotten, The Viking Press, New York, 1937, 217 pp.

Evolution of a race of supermen. Compare with Stockly.





Wells, H. G., Julian S. Huxley, and G. P. Wells, The Science of Life, Doubleday, Doran and Company, Inc., Garden City, New York, 1931, Vol. I, x + 773 pp.

Hormones and nervous system, pp. 97-139.

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\_\_\_\_\_, Vol. II, ix + 774-1514 pp.  
Behavior, Pavlov, Watson, Freud. For bright pupils.

Wharton, Don, "Fraternity in a Factory," Reader's Digest (October, 1941), 39: 53-4.

Cooperation for mutual benefit in industry. Compare with Heard and Melville.

Wheeler, William M., Ants, Columbia University Press, New York, 1910, xxv + 665 pp.

Perhaps the best book on ants.

Wiggam, Albert E., "Do Your Eyes See Alike?" Reader's Digest (February, 1941), 38: 76-9.

Discussion of aniseikonia: images of unequal size brought to brain by the two eyes. How to cure.

Wood, George C., and Harry A. Carpenter, Our Environment, Allyn and Bacon, Boston, 1938, xii + 980 + 85 pp.

Textbook reference on behavior, pp. 372-93, 549-610, 692-725, 915-65.

Woodruff, Lorande L., Foundations of Biology, The Macmillan Company, New York, 1941, 6th Edition, xvii + 773 pp.

Nervous system structure.

### General Bibliography

American Educational Research Association, "Psychological Tests and Their Uses," Review of Educational Research (February, 1941), 11: 1-132.

Use of factor analysis and specific ability tests.

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\_\_\_\_\_, "Mental and Physical Development," Review of Educational Research (February, 1939), 9: 1-141.

Inborn reflexes, needs to aid further research, theories in relation of intelligence to physique.

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DEPARTMENT OF CHEMISTRY

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RESEARCHES OF THE DIVISION OF THE PHYSICAL SCIENCES

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AT THE ANNUAL MEETING OF THE DIVISION OF THE PHYSICAL SCIENCES  
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THE COMMITTEE ON THE PROGRESS OF THE RESEARCHES OF THE  
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Anderson, L. H., "Education and Psychology," Review of Educational Research (February, 1938), 8: 19-24.

Findings on details of learning and teaching, such as shorter objective test equal to longer in value.

Anderson, E. E., "Sex Hormones and Emotional Behavior," Pedagogical Seminary (March, 1940), 56: 149-74.

No proven decrease in timidity under sex drive that can be shown due to it.

Bartlett, Warren L., "Project in Purposeful Reading in Biology," Science Education (February, 1939), 23: 68-70.

Practical and successful reading program.

Beauchamp, Wilbur L., Instruction in Science, Monograph No. 22, National Survey of Secondary Education, United States Department of the Interior, Office of Education, Washington, D. C., 1933, 63 pp.

Useful survey of current practices and weaknesses in science teaching.

Billett, Roy O., Fundamentals of Secondary-School Teaching, Houghton Mifflin Company, New York, 1940, xvi + 671 pp.

Survey of learning, social order, teaching practices, and development of the unit method from the best in these practices.

\_\_\_\_\_, Provisions for Individual Differences, Marking, and Promotion, Bulletin 1932, No. 17, National Survey of Secondary Education, U. S. Government Printing Office, Washington, D. C., 1932, xi + 472 pp.

Thorough survey of current practices, and their implications.

Bode, Boyd H., How We Learn, D. C. Heath and Company, Boston, 1940, 308 pp.

Survey of past theories of learning, and suggestions for the future.

Bousfield, W. A., "A Simple Demonstration of the Conditioned Response," The American Biology Teacher (December, 1939), 2: 70.

Directions for simple and effective experiment.

Bridges, K. M. Banham, "A Genetic Theory of the Emotions," Pedagogical Seminary (December, 1930), 37: 514-27.

Emotions develop from basis of excitement and are largely acquired according to one's experiences.

Brody, L., "Comparable Tests of Verbal and Non-Verbal Reasoning: Their Construction and Application to Developmental Problems," Journal of Educational Psychology (March, 1940), 31: 180-94.

Both depend on age, but verbal develops longer, and abstract comes last.





Chase, Stuart, "What Makes the Worker Like to Work?" Reader's Digest (February, 1941), 38: 15-20.

Wants to "stay put," "belong," be useful, feel important.

Cobb, Bertha B., Madeline W. Cobb, and Ernest Cobb, The Mind's Eye, The Arlo Publishing Company, Newton Upper Falls, Massachusetts, 1941, 256 pp.

Mental picture and common sense in education.

Conkey, Ruth C., "Psychological Changes Associated with Head Injuries," Unpublished doctor's dissertation, Columbia University, 1938, 61 pp.

Effects are shorter attention span, mental lags behind physical recovery, some psychological effects remain.

Courtis, S. A., "Past and Present Trends in Educational Measurement," Review of Educational Research (December, 1938), 8: 547-50.

Standardize, not find laws, use statistics, study character and personality, study individuals.

Curtis, Francis D., Investigations of Vocabulary in Textbooks of Science for Secondary Schools, Ginn and Company, New York, 1938, viii + 127 pp.

Selects 629 terms for general science, 825 for biology, 543 for chemistry.

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\_\_\_\_\_, Second Digest of Investigations in the Teaching of Science, P. Blakiston's Sons and Company, Inc., Philadelphia, 1931, xx + 424 pp.

Useful survey of current methods and trends.

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Useful survey of recent methods and trends.

Davis, Mount E., "The Effect of an Obstacle in Right Responses Upon Learning Efficiency," Unpublished master's thesis, University of Colorado, 1939, abstract in University of Colorado Studies, 26: 46.

Group having obstacle learned maze in fewer trials and with fewer errors.

DilMichael, Salvatore, "The Effect of Deserved Praise and Reproof Upon Classroom Performance," Unpublished master's thesis, Fordham University, 1939, 46 pp.

On math problems, none.

Dunlap, K., and R. M. Dorcus, "Habits, Good and Bad," Business Education World (February, 1941), 21: 467-9.

Method of changing habits circumspect.



\_\_\_\_\_, "To Reach a Goal, Forget It," Business Education World (March, 1941), 21: 573-6.

Methods of habit formation, including "negative practice."

Eastman, Max, "Socialism Doesn't Jibe with Human Nature," Reader's Digest (June, 1941), 38: 41-9.

Theory of man's basic nature and needs.

Educational Policies Commission, The Purposes of Education in American Democracy, National Education Association of the United States, Washington, D. C., 1938, ix + 157 pp.

Four basic objectives, and applied to science.

Faculty Members of the Laboratory Schools of the University of Chicago, Science Instruction in Elementary and High-School Grades, The University of Chicago, 1939, viii + 252 pp.

Specific suggestions on organization and teaching of a unit, with methods of evaluation.

Fitts, P. M., "Perseveration of Non-Rewarded Behavior in Relation to Food-Deprivation and Work Requirement," Pedagogical Seminary (September, 1940), 57: 165-91.

Stopping of reward does not always stop the response.

Garrett, Henry E., Great Experiments in Psychology, D. Appleton-Century Company, Inc., New York, 1941, Revised edition, xxi + 452 pp.

Excellent summary, revising S-R bond theory of learning and recognizing Lashley.

Gray, J. Stanley, "A Biological View of Organic Behavior," Educational Administration and Supervision (September, 1931), 17: 462-70.

Presents two theories of behavior. Favors Lashley and Ritter instead of S-R bond.

Hart, H. N., "Guidance, Soft Pedagogy, Psychometry, and Scientific Nonsense," High Points (November, 1939), 21: 24-9.

Need to restrict clinical psychology to thoroughly competent men.

Haupt, George W., An Experimental Application of a Philosophy of Science Teaching in an Elementary School, Bureau of Publications, Teachers College, Columbia University, New York, 1935, vi + 109 pp.

Grade placement of subject matter depends on its complexity and pupil's experiential background.

Heiss, Elwood D., Ellsworth S. Obourn, and C. Wesley Hoffman, Modern Methods and Materials for Teaching Science, The Macmillan Company, New York, 1940, x + 351 pp.

Summary of science principles, methods, and sources of materials.

1870

Received of the Hon. Secy. of the Navy  
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"The Home Education of Our Son" (His father), Reader's Digest (July, 1941), 39: 23-6.

Basic philosophy with common sense.

Jung, Frederic T., Anna R. Benjamin, and Elizabeth C. Earle, Anatomy and Physiology, F. A. Davis Company, Philadelphia, 1941, xxvi + 666 pp.

Good reference on physiology and nervous system, but conservative on S-R bond theory.

Kohler, Wolfgang, The Mentality of Apes, Harcourt, Brace and Company, New York, 1926, viii + 336 pp.

Famous and thought-provoking study of ape learning.

Lashley, Karl S., Brain Mechanisms and Intelligence, The University of Chicago Press, 1929, xiv + 186 pp.

The most important single reference on behavior. Upsets the S-R bond theory of mechanistic learning and suggests total brain activity.

\_\_\_\_\_, "Integrative Functions of the Cerebral Cortex," Physiological Reviews (January, 1933), 13: 1-42.

Evidence of mutual dependence of brain parts; specialization of structures less important than mass of tissue.

\_\_\_\_\_, "The Thalamus and Emotion," Physiological Reviews (January, 1938), 45: 42-61.

Actually plays a very minor part in emotions.

Morey, Robert, "Basic Needs of Man in Society," Journal of Educational Research (September, 1940), 34: 1-14.

Physical needs, health, and favorable surroundings explained in detail.

Murphy, Gardner, A Briefer General Psychology, Harper and Brothers, New York, 1935, xviii + 572 pp.

Good reference, giving philosophy of sense organs, diagrams, and suggested activities.

Noll, Victor H., The Teaching of Science in Elementary and Secondary Schools, Longmans, Green and Company, New York, 1939, viii + 238 pp.

Good summary of existing practices and findings. Suggestions for the future.

Powers, S. Ralph (Chairman), A Program for Teaching Science, Thirty-First Yearbook, National Society for the Study of Education, Part One, Public School Publishing Company, Bloomington, Illinois, 1932, xii + 370 pp.

Useful survey of science teaching and recommendations for the future.





Powers, S. Ralph, "Science," Review of Educational Research (February, 1938), 8: 60-6.

Summary of recent science findings for teaching.

Prescott, Daniel A. (Chairman), Emotion and the Educative Process, American Council on Education, Washington, D. C., 1938, xviii + 323 pp.

Thorough study of the nature of emotions and their importance in education.

\_\_\_\_\_, "The Growth and Development of the Secondary School Student," The Bulletin of the National Association of Secondary-School Principals (December, 1940), 24: 27-37.

Evaluates physical and mental growth as related to education.

Preston, Carleton L., The High School Science Teacher and His Work, McGraw-Hill Book Company, Inc., New York, 1938, xvii + 272 pp.

Purpose of science, past, methods, laboratory work.

Riddle, Oscar (Editor), The Teaching of Biology in Secondary Schools of the United States, The Committee on the Teaching of Biology of the Union of American Biological Societies, 1942, 76 pp.

Results of 3,186 answers to 16,000 questionnaires mailed in 1939-40 throughout the United States to biology teachers. Most up-to-date and comprehensive survey of biology teaching available.

Ruch, Floyd L., Psychology and Life, Scott, Foresman and Company, New York, 1941, xii + 754 pp.

Up-to-date and interesting. Valuable reference.

Stowe, A. Monroe, Principles of Human Behavior, Booklet mimeographed at the University of New Hampshire, 1941, 36 pp.

Excellent teacher reference for ideas.

Thayer, V. T. (Chairman), Science in General Education, D. Appleton-Century Company, Inc., New York, 1938, xiii + 591 pp.

Progressive viewpoint on science education.

Thurstone, L. L., Primary Mental Abilities, The University of Chicago Press, 1938, ix + 121 pp.

Finds 12 factors in intelligence, 7 important.

Weckstein, Abraham, "Laboratory Work in Elementary General Biology in the Secondary School," Unpublished doctor's dissertation, New York University, 1939, 128 pp.

Lack of standardization and need of core materials.

Wolffe, Dael L., and Helen M. Wolffe, "Development of Cooperative Behavior in Monkeys and Young Children," Pedagogical Seminary (September, 1939), 55: 137-75.

Formal language seems necessary for cooperation.



Zechiel, A. Norris, "Experimental Work and Progress in the Field of Science," Educational Research Bulletin (November 16, 1938), 17: 248-54.

Modern viewpoint on science aims and methods. Core plus practical problems and cooperative planning.





## APPENDIX



Appendix A. A List of the Tables of Contents of Ten Modern Textbooks of Biology.

1. Baker, Arthur O., Lewis H. Mills, and William L. Connor, Dynamic Biology, Rand McNally and Company, New York, 1938, x + 732 pp.

Unit 1. Exploring the Earth for Living Things.

Unit 2. The Fascination of Microscopic Life.

Unit 3. Conquering Dangerous Microbes.

Unit 4. Allies in Keeping Healthy.

Unit 5. Friends and Foes Among the Insects. (b) <sup>1/</sup>

Unit 6. Life Processes in Plants and Animals. (a)

Unit 7. Exploring the Plant and Animal Groups. (b)

Unit 8. On Nature's Trails. (b)

Unit 9. How Life Forms Depend Upon One Another.

Unit 10. How Plants and Animals Behave. (c)

Unit 11. Replenishing the World With Life.

Unit 12. From Fertilized Egg Cells to Independent Organisms.

Unit 13. The Laws of Heredity and the Improvement of Mankind.

Unit 14. Changing Forms of Living Things.

2. Kroeber, Elsbeth, and Walter H. Wolff, Adventures With Living Things, D. C. Heath and Company, New York, 1938, xiii + 798 pp.

Part I. The Many Living Things of This Earth--11 chapters. (b)

Part II. How Plants and Animals Live.

Unit 1. What Have Animals and Plants in Common? (a)

1/Units, chapters, or parts dealing wholly or in part with physiology, classification, and behavior are lettered (a), (b), and (c), respectively, to bring out the fact that physiology and classification are presented before behavior in all the textbooks listed.



- Unit 2. How Do Plants and Animals Obtain Their Food? (a)
- Unit 3. How Do Animals and Plants Use Their Food? (a)
- Unit 4. How Do Living Things Prepare Food So That It Can Be Used for Assimilation and Oxidation? (a)
- Unit 5. How Are the Needs of Cells Supplied in Plants and Animals? (a)
- Unit 6. Why Do Living Things Behave As They Do? (c)
- Unit 7. How Do Living Things Reproduce?
- Unit 8. How Are Plants and Animals Fitted to Survive?
- Unit 9. What Methods Does Man Use in the Struggle With Other Organisms?

Part III. Great Generalizations of Biology.

- Unit 10. There Is Unity in All Living Things.
- Unit 11. There Is a Balance of Life on This Planet.
- Unit 12. Constant Change Is Characteristic of the Earth and Its Inhabitants.
- Unit 13. The Organism Is the Product of Its Heredity and Environment Working Together.
- Unit 14. The Accumulation of Small Changes in Organisms Throughout the Ages Has Produced the Many Types of Today.
- Unit 15. The Future of Mankind Is Rich With Possibilities of Betterment.

3. Moon, Truman J., and Paul B. Mann, Biology, Henry Holt and Company, New York, 1938, x + 866 + c pp.

- Unit 1. The Fundamental Likenesses of All Living Things.
- Unit 2. How Plants Solve the Problems of Life. (a, b)
- Unit 3. How Invertebrates Solve the Problems of Life. (a, b)
- Unit 4. Vertebrates Have Life Problems Similar to Those of Lower Animals. (a, b)





- Unit 5. Life Brings Relationships Between Plants and Animals and Between Organisms and Their Inorganic Surroundings.
- Unit 6. Plant and Animal Life Through the Ages Has Constantly Become More Complex.
- Unit 7. Man Has Similar Biological Problems. (a)
- Unit 8. The Life Problems of Man Are More Complex Than Those of Other Animals Because of His More Complex Nervous System. (c)
- Unit 9. Man Solves Biological Problems and Makes Adjustments with His Environment. (c)
- Unit 10. Biology Contributes to World Progress.

4. Smith, Ella T., Exploring Biology, Harcourt, Brace and Company, New York, 1938, xii + 696 pp.

- Unit 1. All Living Things Are Made of Cells.
- Unit 2. Living Things Can Be Classified Systematically. (b)
- Unit 3. Food and Oxygen Are Carried to Every Living Cell. (a)
- Unit 4. All Living Things Depend Upon Each Other for Existence.
- Unit 5. Man Is Rapidly Increasing His Control Over His Own Health.
- Unit 6. Reproduction Insures the Continuity of Life.
- Unit 7. All Plants and Animals Resemble Their Immediate Ancestors.
- Unit 8. Plants and Animals Are Forever Changing.
- Unit 9. Heredity and Environment Control Behavior. (c)

5. Wood, George C., and Harry A. Carpenter, Our Environment, Allyn and Bacon, New York, 1938, xii + 980 + 85 pp.

Division A. Distribution of Life in Time and Space.

Part I. Living Things Live in an Environment.

- Unit 1. The Wealth of Life About Us.
- Unit 2. The World of Change In Which We Live.

1. The first section of the report deals with the general situation of the country and the progress of the work during the year.

2. The second section deals with the results of the work done during the year, and the progress made in the various branches of the study.

3. The third section deals with the financial statement of the work, and the progress made in the various branches of the study.

4. The fourth section deals with the results of the work done during the year, and the progress made in the various branches of the study.

5. The fifth section deals with the results of the work done during the year, and the progress made in the various branches of the study.

6. The sixth section deals with the results of the work done during the year, and the progress made in the various branches of the study.

7. The seventh section deals with the results of the work done during the year, and the progress made in the various branches of the study.

8. The eighth section deals with the results of the work done during the year, and the progress made in the various branches of the study.

9. The ninth section deals with the results of the work done during the year, and the progress made in the various branches of the study.

10. The tenth section deals with the results of the work done during the year, and the progress made in the various branches of the study.

Division B. The Unity of Life.

Part II. The Life of the Somatoplasm: Nutrition.

Unit 3. All Living Things Have the Same Fundamental Problems to Solve. (a)

Unit 4. All Living Things Are Built on the Same Unit Plan. (b)

Division C. Problems of Adjustment Among Living Things.

Unit 5. Plants and Animals Develop Widely Different Nutritional Relations to Their Environment. (a, b)

Unit 6. Plants and Animals React to Their Environment. (c)

Division D. Problems of Race Continuity Among Living Things.

Part III. The Life of the Germplasm, or Reproduction.

Unit 7. Reproduction and Race Preservation.

Unit 8. Variation and Heredity as the Basis of Race Modification. (c)

Division E. Man's Problems of Environmental Control.

Part IV. The Control of the Environment and of Living Things by Man.

Unit 9. Man Changes and Improves His Environment Through His Increased Knowledge of Natural Laws.

Division F. The Problems of Self-Control.

Part V. Control of Man by Man.

Unit 10. Man Increases His Comfort and Racial Well-Being by a Better Use of the Laws of Life.

Unit 11. Man Improves His Mind and Aids Human Progress by the Proper Use of the Scientific Method.

6. Curtis, Francis D., Otis W. Caldwell, and Nina H. Sherman, Every-day Biology, Ginn and Company, New York, 1940, xi + 698 pp.

Unit 1. Some Major Problems Which Living Things Must Solve.

Unit 2. Plants and the World's Food Supply.

Unit 3. The Kinds of Living Things. (b)

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- Unit 4. Conservation of Living Things.
- Unit 5. Structures and Processes Concerned with Nutrition. (a)
- Unit 6. The Responses of Living Things. (c)
- Unit 7. The Control of Disease and the Improvement of Health.
- Unit 8. The Continuance and Improvement of Living Things.

7. Downing, Elliot R., and Veva M. McAttee, Living Things and You, Lyons and Carnahan, New York, 1940, xxv + 673 pp.

- Unit 1. Living Things.
- Unit 2. Being Alive. (a)
- Unit 3. Plant Factories. (a)
- Unit 4. The Plant Kingdom. (b)
- Unit 5. The Animal Kingdom. (b)
- Unit 6. Friends and Foes.
- Unit 7. Societies.
- Unit 8. Digging Up the Past.
- Unit 9. Early Man.
- Unit 10. Embryology.
- Unit 11. Heredity.
- Unit 12. Behavior. (c)
- Unit 13. Conservation.
- Unit 14. Biology and You.

8. Hunter, George W., Problems in Biology, American Book Company, 1940, xii + 706 pp.

Part I. Living Things in Relation to Each Other and Their Surroundings.

- Unit 1. The World We Live In and What We Take From It. (a)

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Unit 2. What Is Being Alive? The Functions of Living Things. (c)

Unit 3. How Are Plants and Animals Mutually Dependent?

Unit 4. How and Why Do Seed Plants Succeed in Life?

Part II. Green Plants Make the Food of the World.

Unit 5. Why Do Seeds Germinate?

Unit 6. Green Plants As Food Makers and Food Users. (a)

Part III. Relationships and Interrelationships of Living Things.

Unit 7. The Plant World and How It Affects Mankind. (b)

Unit 8. How Do We Classify the Animals? (b)

Unit 9. What Effects Have the Surroundings on the Lives of Plants and Animals?

Part IV. The Biology of Man.

Unit 10. How Does the Human Machine Do Its Work? (b)

Unit 11. How Does Man Determine the Values of Foods? (a)

Unit 12. How Is Food Prepared for Body Uses? (a)

Unit 13. How Are Foods Circulated and Used in the Body? (a)

Unit 14. How Has Man Become the Conqueror of the World? (c)

Part V. Man's Interrelationship with Other Living Things.

Unit 15. How Does Man Control His Environment for Health?

Unit 16. How Does Man Control His Environment for Wealth?

Unit 17. How Does Man Conserve His Natural Resources?

Unit 18. How Does Man Control the Improvement of Living Things?

Unit 19. How May Biology Aid in My Own Improvement?

Unit 20. Who Are Some of the Makers of Biology?



9. Hunter, George W., Life Science, American Book Company, New York, 1941, xii + 803 pp.

Biology for Work and Play. (b)

A. Biology and Life Activities.

B. The Parade of the Living World.

Personal Biology.

Unit 1. Biology for the Consumer.

Unit 2. Our Human Machine. (a, c)

Unit 3. The Torch of Life.

Biology in Our Lives.

Unit 4. Life and the Environment. (c)

Unit 5. The Web of Life.

Unit 6. The Food Factories of the World. (a)

Unit 7. Why Are Living Things Alike and Yet Unlike?

Unit 8. Life on the Earth Is Always Changing.

Biology and Social Life.

Unit 9. Biology and Citizenship.

Unit 10. Biology and Social Life. (c)

Unit 11. Biology and Conservation.

Unit 12. Social Progress Depends Upon Biology. (c)

10. Ritchie, John W., Biology and Human Affairs, World Book Company, New York, 1941, xiv + 1026 pp.

Unit 1. Why We Study Biology.

Unit 2. The Diversity of Life.

Unit 3. The Unity of Life.

Unit 4. Changes in Living Things.





- Unit 5. Fundamental Life Problems. (a)
- Unit 6. Methods and Problems of Reproduction.
- Unit 7. A Study of Simple Organisms. (b)
- Unit 8. Two Representative Animal Groups. (b)
- Unit 9. The Cold-Blooded Vertebrates. (b)
- Unit 10. The Warm-Blooded Vertebrates. (b)
- Unit 11. The Mammalian Body. (a, b)
- Unit 12. The Plant Plan. (b)
- Unit 13. Parasitology and parasites.
- Unit 14. Nutrition. (a)
- Unit 15. Heredity.
- Unit 16. Behavior. (c)
- Unit 17. Animal Communities.
- Unit 18. Types of Water Animals.
- Unit 19. Life in the Sea.
- Unit 20. The Land Plants.
- Unit 21. Springtime Biology.
- Unit 22. Our Biology Course.

1. The first part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are given in a more formal, printed style. The list is organized in a columnar fashion, with names in the first column and addresses in the second column.

2. The second part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are given in a more formal, printed style. The list is organized in a columnar fashion, with names in the first column and addresses in the second column.

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8. The eighth part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are given in a more formal, printed style. The list is organized in a columnar fashion, with names in the first column and addresses in the second column.

9. The ninth part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are given in a more formal, printed style. The list is organized in a columnar fashion, with names in the first column and addresses in the second column.

10. The tenth part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are given in a more formal, printed style. The list is organized in a columnar fashion, with names in the first column and addresses in the second column.

Appendix B. Lectures, Quizzes, and Stories Used in the Teaching of the Unit on Behavior During 1941-42.

Lecture 1. Tropisms. (November 18-19, 1941)

Tropism defined: The turning toward or away from a stimulus.

Types of tropisms:

1. Positive: turn toward.
2. Negative: turn away from.

Found in plants and lower animals.

Stimulus defined: A force or substance which acts on a living organism.

<u>Plant stimuli:</u>	<u>Name of tropism:</u> (Optional)
-----------------------	------------------------------------

- |              |                |
|--------------|----------------|
| 1. Chemicals | Chemotropism.  |
| 2. Contact   | Thigmotropism. |
| 3. Gravity   | Geotropism.    |
| 4. Heat      | Thermotropism. |
| 5. Light     | Phototropism.  |
| 6. Water     | Hydrotropism.  |

Examples of each of the six groups, both positive and negative.

Quiz 1. Behavior and Tropisms. (November 19, 1941)

1. What is behavior?
2. What is a stimulus?
3. What is a tropism?
- 4-9. Name six types of stimuli the response to which may be called a tropism.
10. What kinds of living things have tropisms?





Lecture 2. Hormones. (November 19-20, 1941)

Defined: An hormone is a chemical messenger (Greek: to arouse, or excite).

Made: In "ductless" glands, so-called because the secretions pour directly into the blood, and not through any tube or duct.

Types:

Thyroid Gland: Thyroxin (65% iodine), in thyroid gland in neck.

Underactive: Endemic goiter, or hypothyroidism: fat, puffy, thick skin, sluggish; if severe called myxedema; if from birth person is a cretin (slower oxidation in body). Remedy: iodine tablets.

Overactive: Toxic goiter, or hyperthyroidism: faster oxidation, nervous, thin, hungry, restless, genius? Remedy: operation to remove.

Parathyroids: Four glands in neck on thyroid.

Underactive: Too little calcium in blood, tetany spasms and death.  
Remedy: give hormone and more calcium in diet.

Overactive: Drowsy and dull, death. Remedy: inject sodium salts.

Pituitary: Imbedded in the brain. Front lobe hormone regulates growth.

Underactive: Dwarf.

Overactive: Giant, if from birth; if overactive in teens, big hands and feet--acromegaly.

Other hormones: One regulates sugar oxidation; another hastens child-birth if injected; prolactin makes the mammary glands secrete milk; another influences the female reproductive functions.

Adrenals: Two, on kidneys. Adrenalin liberates sugar, speeds heart beat, raises blood pressure, stops digestion, sends blood to arms and legs, controls skin bleeding, starts stopped heart.

Pancreas: Islets of Langerhans make insulin, which enables the body to burn sugar.

Underactive: Sugar diabetes.

Overactive: Too little sugar in body.

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Thymus: In neck; degenerates when you mature, speeds up maturing.

Pineal: Imbedded in brain, former third eye; seems to affect rate of maturing, slows it down.

Small intestine: Secretin, which makes the pancreatic juice flow.

Gonads: Sex hormones which affect maturing.

Liver: Unknown hormone which prevents pernicious anemia (lack of red corpuscles).

Summary: Hormones are chemicals which affect health and behavior. All but insulin, secretin, and the liver hormone are made in ductless glands. The thyroid hormone affects metabolism; those of the pituitary, growth, childbirth, etc.; parathyroids, calcium metabolism; adrenals and pancreas, sugar metabolism, balancing each other; thymus, pineal, and gonads seem to affect maturity; liver, red corpuscles.

#### Quiz 2. Hormones. (November 21, 1941)

1. What is an hormone?
2. In what kind of organ are most hormones made?
3. What effects has thyroxin on the body?
4. The parathyroid hormone?
5. Adrenalin?
6. Insulin?
7. The pituitary hormones?
8. What two hormones counterbalance each other?
9. What hormones, or glands, influence your growing up, or maturing?
10. Tell about one other hormone.

#### Lecture 3. The Nervous System. (November 25-26, 1941)

##### Types:

1. Ring: Jellyfish, starfish.



2. Ladder: Worms, arthropods, vertebrates (chordates).

Development:

1. From ectoderm germ layer.
2. Higher and more complex the animal, more complex its nervous system.

Neuron:

1. Name of a nerve cell, specialized for function of sensitivity.
2. Elongated, insulated, carries electro-chemical impulse 350 feet per second (4 miles per minute).
3. Dendrites, cell body and nucleus, axon, "synapse."

Man:

1. Biggest cerebrum, most intelligence.
  - a. Big cerebrum, and hand with opposite thumb, our two biggest advantages over other forms of life.
2. Central nervous system:
  - a. Brain (cerebrum, cerebellum, medulla), and 12 pairs of branch nerves.
  - b. Spinal cord (two parallel cords fused together), and 31 pairs of branch nerves.
  - c. Billions of tiny branch nerves.
  - d. Organs of hearing, sight, smell, taste, and touch.
3. Automatic nervous system:
  - a. Two parallel nerve cords.
  - b. Many plexes along these cords (as cardiac, solar, and hypogastric).
  - c. Billions of tiny branch nerves.
  - d. Two systems connected by dorsal, sensory roots of spinal nerves.



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1964

Dear Mr. [Name]:

I have received your letter of [Date] regarding [Subject].

Very truly,  
[Signature]

[Name]  
[Title]

[Address]  
[City, State, Zip]

[Phone Number]

cc

[Name]  
[Title]

[Address]  
[City, State, Zip]

[Phone Number]

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[Name]  
[Title]

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[Name]  
[Title]

[Address]  
[City, State, Zip]

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[Name]  
[Title]

[Address]  
[City, State, Zip]

Brain:

1. Billions of outer (cortex), "gray matter" nerve cells, no permanent connections with each other.
2. Inside, "white matter" fibers, each from a "gray matter" cell, which connect the brain with the rest of the body.
3. Cavities (four), filled with salt water.
4. Entire brain seems in some ways to act like an electrolytic solution, though many claim set pathways are established as we learn and grow older.

Brain functions:

1. Cerebrum: Consciousness, emotion, intelligence, memory.
2. Cerebellum: Balance (also ear semicircular canals) and muscular coordination.
3. Medulla: Influences heartbeat, breathing, etc., and is relay center.

Spinal cord: Relay center.

Automatic system: Rhythmic work of internal organs (with some influence from the medulla).

Reflex arc:

1. Sensory (dorsal) nerve.
2. Associative (spinal cord) nerve.
3. Motor (ventral) nerve.

New situation: No reflex, so sensory nerve transmits message to a nerve fiber to the cerebrum, where judgment is passed and an intelligent response made. When the situation becomes familiar, deliberate judgment is not required, and the act becomes more automatic, i.e., is not referred to the cerebrum each time, but to the lower brain centers.

Quiz 3. The Nervous System. (December 1, 1941)

1. What is a neuron?



2. Name the three main parts of a neuron.
3. Name the connection between two neurons.
4. What type nervous system has man?
- 5-8. Name the four main parts of man's central nervous system.
- 9-11. Name the three main parts of man's automatic nervous system.
12. How are the two systems connected?
13. What is the function of the cerebrum?
14. The cerebellum?
15. The medulla?
16. The spinal cord?
17. The automatic nervous system?
- 18-22. Name the sense organs by means of which we are aware of our surroundings.
23. What is a reflex arc?
- 24-25. What two organs are most important in making us superior to other living things?

#### Lecture 4. Types of Behavior. (December 2-3, 1941)

Behavior: Everything that a living thing does.

Types of behavior:

1. Tropism: The turning toward or away from a stimulus.
  - a. Positive--toward; negative--away from.
  - b. Plants and simple animals.
  - c. To chemicals, contact, gravity, heat, light, and water.
2. Reflex action: An unlearned, quick, simple response found only in animals.
  - a. Inborn: Babinski, changing pupil size to adjust eye to light,





coughing, crying, gasping, jumping at loud, unexpected sounds, laughing, patellar, scowling, sneezing, snoring, swallowing, trembling, vomiting, winking, withdrawing hand from pain, yawning, etc. About 50 in man.

- b. Conditioned: Pavlov's dogs; perhaps most learning.
- 3. Habit: One or usually, a group of conditioned reflexes working according to a fixed pattern; a response usually learned by repetition and done without thinking.
  - a. "All our life, so far as it has definite form, is a mass of habits."--William James. "Habit is the most important element in human behavior."--George A. Dorsey.
  - b. To form a habit: Associate a new stimulus with an old one until the act is automatic. Make a strong start, no exceptions, be interested, practice often, "negative practice" sometimes useful (commercial and stammering, not alcohol and music).
  - c. To break a habit: Replace with a good one, and stop completely.
- 4. Instinct: A group of related, inborn reflexes working according to a fixed pattern. Cat catching a mouse, etc. Best modern thought says humans have none.
- 5. Memory: To be conscious of something previously experienced.
- 6. Reason: To evaluate factors in a situation and reach a conclusion.
- 7. Emotion: An aroused state of feeling, affecting the whole body. Bridges' theory.

Excitement is the basic emotion. This develops into distress, excitement, and delight. Further refinement, by the time a child is two: distress becomes fear, anger, and distress; excitement remains excitement; delight becomes delight, joy, and affection. There is further differentiation during childhood and adolescence "such as shame, jealousy, anxiety, elation, parental and sexual affection.

"A particular emotion is distinguished more by the general overt behavior in connection with the situation that arouses it than by the accompanying visceral reactions. The latter....vary from individual to individual, and in different instances of the same emotion....

"The emotions....are largely acquired. No two individuals develop the same set of emotions, because of constitutional and

The first part of the paper is devoted to a general discussion of the problem. It is shown that the problem is of great importance in the theory of the structure of the universe.

The second part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the structure of the universe.

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The ninth part of the paper is devoted to a detailed discussion of the problem. It is shown that the problem is of great importance in the theory of the structure of the universe.

environmental differences. But there are some emotions, based on common experiences, which are much the same for all....

"There is probably an original undifferentiated emotion of excitement. It consists of somewhat uncoordinated visceral and skeletal reactions given in response to gross stimulation of any kind. Some of the visceral reactions become differentiated from the rest, conditioned to certain stimuli, and combined with particular skeletal responses as a result of experience to form the various well-known emotions."<sup>1/</sup>

8. Inhibition: The controlling of one's reaction to a stimulus.

a. Housebroken (definition of a baby),<sup>2/</sup> and other self-mastery; also, to get along without wanted things, and to get along with other people.

b. Sublimation: To direct energies intended for one goal towards another goal.

Drives: The cause of most behavior. Rather complex stimuli arising from our body needs, emotions, and experiences.

1. Morey: Proper food, water, air, control of sleep, temperature, unhealthful and overstimulating materials; health; favorable, predictable surroundings.
2. Chase: Environment one can stay in, belong, have function, and purpose.
3. Ruch: Hunger, thirst, sex, skin conditions, pain, air hunger, fatigue, sleepiness, visceral tensions, warmth and cold, exploratory drive.

Story of "Low Bridge." (December 4, 1941)

A famous man was giving a lecture to a distinguished audience in a large American city. One man in the audience whispered to his companion: "I think the lecturer worked on a canal boat as a deck hand when he was a boy." "Impossible!" replied his companion. "I think I can prove it," said the man in the audience. A few minutes later, during a brief pause in the lecturer's remarks, the man in the audience cupped his hands and

<sup>1/</sup>K. M. Banham Bridges, "A Genetic Theory of the Emotions," Pedagogical Seminary (December, 1930), 37: 514-27.

<sup>2/</sup>A baby is an alimentary canal with a loud noise at one end and no sense of responsibility at the other.



shouted: "Low Bridge!" The lecturer fell flat on his stomach, and stayed there.

Quiz 4. Types of Behavior. (December 9, 1941)

1. Define tropism.
2. Name five types of stimuli the response to which may be called a tropism.
3. Define reflex action.
4. Name five inborn reflexes of people.
5. Define a habit.
6. Name two of your own habits.
7. State briefly a good way of forming a habit.
8. State briefly a good way of breaking a habit.
9. Why are habits important?
10. Define instinct.
11. Define memory.
12. Define reason.
13. Define emotion.
14. May emotions be educated, or are they set at birth?
15. Name two emotions you have experienced during the past 24 hours.
16. Why are emotions important?
17. Define inhibition.
18. Name two inhibitions you have used during the past 24 hours.
19. Name the drives you think are important to most people.
20. Name two drives you have experienced during the past 24 hours.



The first part of the paper discusses the importance of the study and the objectives of the research. It then proceeds to a literature review, followed by a description of the methodology used in the study. The results of the study are presented in the next section, followed by a discussion of the findings and their implications. The paper concludes with a summary of the main points and a list of references.

The study was conducted in a laboratory setting, using a series of experiments to measure the effect of different factors on the rate of reaction. The results show that the rate of reaction increases with increasing temperature and concentration, and decreases with increasing volume. The findings are consistent with the theoretical predictions and have important implications for the design of industrial processes.

The study was funded by the National Science Foundation and the Department of Energy. The authors would like to thank the following people for their assistance and support: Dr. John Doe, Dr. Jane Smith, and Dr. Michael Johnson.

Lecture 5. The Sense of Smell. (December 10, 1941)

Location: The olfactory membranes in the nose.

1. Degenerate. One-fourth square inch area in man; 10 square inches in a dog; 24 square inches in a shark.

Nature: Chemical reaction, substance must vaporize and reach the nose.

How it works: Smell prism of six basic odors: flowery, spicy, fruity, resinous, foul, burnt. Other odors a combination of these.

1. We can taste just four things: sweet, sour, bitter, and salt. All other flavors are due to smell also. Proof: Food has no taste when you have a cold.

Lecture 6. The Ear. (December 10, 1941)

Location: You know.

Parts: Outer, middle, inner.

Outer: Ear trumpet to collect sounds; ear canal with bitter wax to lubricate, and keep out insects.

1. Only kind of deafness doctors can ordinarily cure is that from too much wax in ear: clean it out carefully.
2. Dangerous to scratch ear with pencil--slip and puncture eardrum.

Middle: Ear drum; hammer, anvil, and stirrup bones, Eustachian tube.

Inner: Cochlea, three semicircular canals arranged to check all directions.

Function:

1. Outer: Collect sounds.
2. Ear canal: Carry sounds.
3. Ear drum: Vibrate with sound waves.
4. Hammer, anvil, and stirrup: Transmit vibration to cochlea.
5. Cochlea: Vibrations set up pulsations in fluid which stimulates hair-like nerve endings which carry message along nerve to brain.



6. Eustachian tube: Connects middle ear with mouth. When big gun is fired may open mouth and help equalize air pressure both sides of ear drum; is a roundabout way; to put cotton in ears helps further by hindering air waves coming direct.
7. Semicircular canals: Pulsation of fluid sends message to brain (cerebellum), and gives a sense of balance.

Disorders:

1. Nerve connections cut off by alcohol: drunk reels.
2. Danger of sinus trouble from water up Eustachian tubes.

Range: Can hear from about 30 to 30,000 vibrations per second. People vary.

Lecture 7. The Eye. (December 11, 1941)

Location: You know.

Parts:

1. Sclerotic coat: White, protection, white of eye in front, also transparent cornea which may crystallize white--cateract; cornea helps to focus eye.
2. Choroid coat: Thin, black, becomes iris in front which gives eye its color, also regulates size of pupil opening--amount of light entering eye; ciliary muscles arise from it.
3. Retina: Camera film of eye, back  $2/3$  only as not needed where light cannot reach it. Complex, rods and cones, fovea point of best vision, hitches to optic nerve.
4. Optic nerves: Cross to right eye connects with left side of brain, etc.
5. Lens: Held in place, and focussed, by ciliary muscles.
6. Aqueous humor: In front of lens.
7. Vitreous humor: Fills most of eye; in back of lens.
8. Conjunctiva: Lines outside of cornea and white of eye, inside of eyelids.
9. Nictitating membrane: Vestige of third eyelid, red triangle inner corner of eye.

THE FIRST PART OF THE HISTORY OF THE  
LIFE OF THE LATE LORD OF THE TREASURY  
OF THE KINGDOM OF GREAT BRITAIN  
AND OF IRELAND  
AND OF THE  
COUNTY OF PALMERS

BY  
JAMES OAKLEY  
OF THE  
MIDDLE TEMPLE  
ESQ.

LONDON:  
PRINTED BY  
J. JOHNSON, ST. PAULS CHURCH-YARD.  
1794.

IN TWO VOLUMES.  
THE FIRST VOLUME.

THE SECOND VOLUME.

THE THIRD VOLUME.

THE FOURTH VOLUME.

THE FIFTH VOLUME.

THE SIXTH VOLUME.

THE SEVENTH VOLUME.



Function:

1. Light enters, falls on retina, carries message to brain by optic nerve.
2. Eye is moved by six muscles, is well protected in a conical bony socket.
3. Young-Helmholtz color theory: See red, green, and blue; yellow is combination of red and green.
4. Color-blindness: Usual kind is red-green blindness. Occurs in one man in 25, one woman in 250.

## Quiz 5. Sense Organs. (December 16, 1941)

1. Name the four flavors the tongue can taste.
2. To what chemical sense are all other flavors due?
3. Does the skin give exact temperatures?
4. What parts of the skin are most sensitive to contact?
5. Is there a blind spot in each eye?
6. What, briefly, is eye dominance?
7. What is negative after-image?
8. What is color contrast?
9. What evidence have we that our sense of smell is degenerate?
10. Make a clear, labeled diagram of the human eye or of the human ear.

## Lecture 8. Ways of Learning. (December 19, 1941)

No agreement among authorities. Basis is how the nervous system works: no agreement.

Some known facts:

1. Habits may be formed. We have learned the best known way. (Review)
2. Past experience helps us to understand new things that have some relation to these past experiences.



3. To concentrate and pay no attention to other things helps.
4. To get the main idea or ideas and visualize them is very important. If interesting and worthwhile, such ideas are rarely forgotten.
5. Blind memorizing, unless followed by thinking and understanding, is not worth much. "What about the appropriations?" parrot.

Some details that may help:

1. Understand just what the problem facing you is.
2. Physical conditions good for learning. No strain, but not comfortably relaxed.
3. Skim problem once; then go over it thoughtfully, challenging points new to you or that you disagree with.
4. Taking notes, talking out loud, pacing the floor, looking up various points of view, talking with others about it, all help.
5. Doing something about it, and/or teaching it to others, help.

Summary: No one knows how we learn, but for practical purposes be rested, alert, interested, open-minded, logical, and get the main idea clearly in mind.

Quiz 6. Controlling Behavior. (January 12, 1942)

1. State two advantages of instinctive behavior.
2. State two disadvantages.
3. State three advantages of intelligent behavior.
4. State two disadvantages.
5. If you could choose, would you prefer to have intelligent or instinctive behavior? Why?
6. State the important thing or things in real learning.
7. How does perception affect your behavior?
8. How does heredity affect your behavior?
9. How does environment affect your behavior?
10. What are the three strongest inner controls of human behavior?

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Appendix C. Results of Optional, Related Activities For a Group, No. 8  
Under Dramatizing, Study and Activity Guide.

On Friday, January 9, 1942, a group of boys saw the author after class to plan for a stunt working on the emotions and some other activities. The stunt was worked out and tried on the class on Tuesday, January 13th, and according to the author's notes went as follows.

The author was delayed in the office (as sometimes happens) and came to class a few minutes late. He caught two boys fooling with meter sticks, and a third appeared to have been in the scrap. He said, "O. K. boys, what's the story?" and perhaps made another remark. The boys hesitated; then B.<sup>1/</sup> said "We-el, C.--" and stopped. A. was then asked who started it. He said something like "Well, C. did in a way," reluctantly. C. protested, as he often does. There was a sort of gasp in the class but the author pretended not to hear. He flew into a rage, told C. he had had enough and said "Get out!" Pause. "Report to the office." The boy started, looking mad, paused near the door, and muttered something about getting even. The author shouted "C." as the boy ran out slamming the door, and started after him, then realized it was too late, nodded and shrugged as if to say "I'll get him later," and turned back to the class. He then noticed the box of chalk spilled over the floor, which was not part of the original plan, and angrily exclaimed "And chalk on the floor, too!" He ordered A. and B. up front and asked them to tell him what really happened. B. was nearer the door. The boys were slow starting to talk, and in a minute C. opened the door softly, and, out of sight of most of the class and crouching, fired two blanks with a .22 pistol borrowed from the town fire chief. B. groaned, clutched his left side over which a reddish stain immediately began to spread, and collapsed on the floor. A. shifted a couple of steps to the far end of the bench and crouched down over it. The author looked up, acted stunned, then enraged, and rushed out after the "murderer." He returned in a minute and with A. tried to carry the "victim," who was moaning on the floor, out of the room. Finding him heavy, he had D. help, and the three carried the boy out.

The author returned to ask the pupils to write down exactly what happened, as witnesses, when the three boys came back too soon due to a misunderstanding, grinning, so we had to confess. Several pupils heaved a sigh of relief and all then wrote down what they "saw."

The reports might have been a little more carefully and seriously done had the pupils believed it was<sup>a</sup> real case. On the other hand, some might have held back from telling everything they perceived for fear of legal involvement, and others might have been so sure that it was real that their reports would have been exaggerated beyond what they really

1/Letters are used to conceal identity.





perceived.

A few reports are quoted, both to show the range of detail correctly and incorrectly "seen," and the influence of emotion, thought, and past experience on perception.

(Sophomore boy.) "The Avenger. T. came in biology class Tuesday morning and caught B., C., A. fighting. He said 'O. K. boys, what's the idea.' No one answer. He said 'Who started it.' B. said 'Well er-er C.' T. 'What about it A.' A. said 'Well C. started it' T. said 'C. get out' and C. walk out of class.

"T. called the two other boy to his desk and said 'O. K. boy--what's the story' No one answer. Suddenly C. came at the door a gun in his hand he fired two shots at B. and started running with T. in pursuit. T. came back and asked D. to carry B. out."

(Senior girl.) "When T. came in the room he caught the 3 boys in the act of hitting each other with the yard sticks. They knew they were caught and didn't know who to blame; they hated to expose their friend who was responsible for it. T. send C. out of the room. He halloed 'get out.' Then he said 'and spill the chalk on the floor too.' He called C. back again. C. stood in the door and shot B. T. shouted to D. to come and help carry B., who was moaning on the floor. They carried him out. In the meantime, the biology class who did not know what it was all about were very scared. The expressions on the girls faces were very descriptive of their feelings. E. looked as if she was going to cry. I was standing down nearer B. ready to telephone Dr. F. and I certainly thought he would be needed."

(Senior boy.) "T. entered the room to see a fight with meter sticks between C., B., and A. As T. entered the room the fight stopped and A. quietly left the scene and went to his stool. The other boys said C. started it. T. in a rage, told C. to leave the room. He left and as the other boys came to the front of the room to pick up the chalk, after T. shouted to C. to come back, He came back and fired 2 blank shots one of which supposedly hit B. as he fell to the floor. T. rushed out of the room. For further effects B. had red dye daubed on his sweater."

(Junior girl.) "C. started fooling and got two others boys into it by pestering them. In the first part of it C. knocked a box of chalk off the table. When T. came into the room he appeared very angry and asked who started the fooling which was going on. B. said, 'Well, C.' and refused to say any more. A. said 'C. started it in a way.' T. ordered C. out of class. C. ran out and slammed the door. T. called him back, but it was too late. T. called B. and A. up and asked them how it really started. As they were about to tell him C. snuck around the door and (supposedly) shot B. T. & two other boys carried him out. If this has been an actual happening C. would have been very foolish



because there were too many witnesses.'

(Sophomore girl.) "T. walked into the room while C., A., and B. were fooling. He immediately demanded what had happened and both A. and B. blamed C. T. yelled at him to get out. He left and slammed the door. T. called A. and B. up in front of him where they were standing when the shot was fired. There were two shots. T. hesitated a moment and then dashed out the door. A. had ducked behind the table and B. was on the floor. T. came in again and he and A. tried to pick B. up from the floor. Then they called D. over and he helped them carry him out. B. seemed to have blood on his hands and side."

(Sophomore boy.) "T. came into the lab. A., B., and C. were fooling with yardsticks. T. asked for the one that started the trouble. B. and A. blamed C. for it. T. sent C. out and was quizing B. and A. about it.

"B. was standing in front of the table in direct line with the door and A. was at the end of the table. T. was behind the table. C. appeared in the door with a revolver and was crouched low. He fired two shots into the room. B. fell and C. started to run down the corridor and T. started after him. B. had a wound in the left side of his stomach.

"T. came back with C. and T. and A. tried to lift B. and carry him out. T. called D. to help them. Then they carried him out."

(Sophomore girl.) "C., A., and B. were fooling with yard sticks. T. came in and caught them. T. asked you started it and the other two boys said C. did. T. sent C. out of the room. The door was partly open and C. shot at B. and hit him. T. and D. carried B. out."

(Sophomore girl.) "C. and A. were fooling with yard sticks and chasing one another around the room. Then B. started to fool with the other two boys. After awhile of that, T. came in, and caught all three boys fooling. He then asked for an explanation. B. and A. blamed it on to C. Then C. was sent out of the room. T. called B. and A. up to the front of the room and again asked what happened. While he was waiting for an answer two shots were heard. T. rushed out. B. fell to the floor. A. started to pick B. up. Then T. came in again and asked D. to help A. and himself take B. out. Then they all came back again with a grin on their faces."

(Sophomore girl.) "The boys were fooling with yardsticks. T. came in and said, 'Well, explain yourselves.' A. went over to his seat beside G. B. looked astonished and T. asked him who started it. B. didn't say anything except, 'Well---C.---.' T. then asked A. who started it. He said that C. did. C. was discharged from the room. A few said it was unfair because A. started it. C. went out and slammed the door.





T. called him back but he didn't come. A couple of minutes later two shots were heard. I thought they were blanks because I knew there were some upstairs for a play to be given Wednesday. B. fainted, because he thought it was a real gun. C. was just trying to scare T. B. had blood (ink) on him. T. got red in the face, acted stunned, and rushed from the room. He came back and he and D. and A. picked up B. and started to carry him off."

(Sophomore girl.) "T. walked into the room and B., C., and A. stopped fighting. There was chalk on the floor. He asked what happened. They said C. started it, and T. sent him out of the room. Then 2 shots were heard and I thought C. had killed himself. But when I looked again B. was on the floor. He was holding on to his chest, and his hand was bloody. T. and ?? picked B. up and took him out."

(Sophomore boy.) "B. and C. were fooling when T. came into the room. A. had just stoped. They each had a stick and A. had two. T. asked what was going on and who started it. B. said C. did it. T. told C. to get out and he went out. Then T. called A. and B. up to the head of the room. C. came to the door and fired two shot and B. fell to the floor and A. ducked behind the table. T. ran after C. and came back. A. and T. and later D. helped pick up B. and took him out. B. had mercurochrome on his side and on his hands."

(Sophomore girl.) "A. and C. were fooling and B. came in and started fooling, too, T. came in and the boys were asked what happened. The couldn't explain, but said C. started it. T. told C. to get out. He went out. The boys were called up to the desk to explain. All at once two shots were fired. B. fell down. There was blood on his sweater. T., A. and D. carried B. out."

The reports of the three sophomore boys are also of interest.

"C. and I came into the room and we started fighting with the yard sticks. I knocked down the chalk. Then B. came into the room and all three of us were fighting with the yard sticks. C. and B. were fighting when T. came in. I was behind the bench. T. asked B. what was the idea. He couldn't explain. He asked me, and I said it was C.'s fault. He said it wasn't. T. told C. to go into the office. Then he asked B. and I to come up front and explain what it was all about. B. was to the left of me. C. shot the gun off and it was pointed towards the ceiling. B. fell to the floor with his hand over his side. Then C. fired another shot and I went behind the bench. T. chased C. out of the room. I went over and rolled B. on his back then T. came in and we took B. out into the hall. then we came back into the room with C."

"I was a little slow in getting into class but when I got there C. and A. were fighting with rulers so I joined the fight. A box of chauck then T. caught us and we blamed it on to C. he through C. out



and brought A. and myself up front and started to question us. I fell and squeezed mercurochrome on my sweater then I started to grone. and they carreyed me out."

"T. came into the room and asked B. and A. what was the matter. They blamed it on to me. T. kicked me out of class. Then he took B. & A. up to the front of the room to talk to them. Then I appeared at the door and fired two shots. B. fell to the floor & A. on the table. T. ran to get me. Then he caught me out into hall and went into the the room & got B. and A. out. Then T. came back and said, 'write what happen'."



## Appendix D. Objective Test Used with the Unit on Behavior During 1940-41.

The following are multiple choice questions. Select one of the answers as the best one, and put its number in the space to the left of the question.

- \_\_\_ 1. The one thing which seems to be true of all things, living and dead, is: 1--They are always changing; 2--they respond to stimuli; 3--they do not live forever; 4--they have been classified into distinct groups by man; 5--they are necessary to men's existence.
- \_\_\_ 2. The reason changes take place is: 1--Unknown; 2--many changes just "happen"; 3--some stimulus or other cause; 4--monotony is contrary to life; 5--some other change makes it necessary.
- \_\_\_ 3. The principal reason that man can guide his living is: 1--He is the most highly developed animal; 2--his intelligence; 3--he can learn by experience; 4--his civilization; 5--he has leisure time.
- \_\_\_ 4. The secret of successful living is: 1--Carefully develop useful habits until you are well trained for your chosen work; 2--never give up; 3--decide what you want, and go after it with all your strength; 4--cooperative balance between intelligence and emotions, with habits a labor-saving device; 5--be alert and adaptable.
- \_\_\_ 5. The two principal controls of behavior are: 1--Heredity and environment; 2--habits and emotions; 3--instincts and intelligence; 4--internal and external stimuli; 5--intelligence and emotions.
- \_\_\_ 6. That which partially controls one's behavior by determining his capacity to respond to stimuli is: 1--Habits; 2--emotions; 3--environment; 4--intelligence; 5--heredity.
- \_\_\_ 7. That which partially controls behavior by supplying or failing to supply stimuli is: 1--Habits; 2--emotions; 3--environment; 4--intelligence; 5--heredity.
- \_\_\_ 8. A reflex action is: 1--A definite response to a definite stimulus; 2--the turning toward or away from a stimulus; 3--jerking your hand away from a hot stove; 4--an unlearned, quick, simple response found only in animals; 5--an action that is the reverse of another action.
- \_\_\_ 9. A habit is: 1--Something that you learn to do; 2--some action that you usually regret; 3--a response learned by repetition and done without thinking; 4--a conscious instinct; 5--something that you do.





- \_\_\_ 10. A habit is formed by: 1--Attempting to do something until you can do it; 2--associating a new stimulus repeatedly with an old one until the act becomes automatic; 3--thinking about something until you know how to do it; 4--watching something being done until you can visualize every step; 5--doing something as carefully as you can.
- \_\_\_ 11. Aids in forming a habit quickly are: 1--Have someone watch you and guide you in your practice; 2--no exceptions; 3--strong start, no exceptions, make practice opportunities; 4--practice as often and long as possible; 5--take a correspondence course.
- \_\_\_ 12. The best way to break a "bad" habit is: 1--Stop it completely; 2--be too busy to find time for it; 3--have someone watch you and stop you every time you do it; 4--gradually do it less and less until you just don't do it any more; 5--replace it with a good one.
- \_\_\_ 13. Turning toward or away from light, heat, water, contact, gravity, and chemicals is called: 1--Responsiveness; 2--a tropism; 3--reaction; 4--instinct; 5--sensitivity.
- \_\_\_ 14. The physical basis of behavior is: 1--Nerves; 2--protoplasm; 3--cells; 4--responsiveness; 5--electricity.
- \_\_\_ 15. A sensory, associative, and motor neuron make up: 1--A reflex arc; 2--reflex action; 3--nerve pathway; 4--stimulus-response; 5--neuron.
- \_\_\_ 16. A nerve impulse is: 1--An electric wave which travels 350 feet per second along a neuron; 2--the electro-chemical change which travels along a neuron; 3--the reaction to a stimulus; 4--a sudden urge to do some particular thing; 5--a minor form of an emotion.
- \_\_\_ 17. The main parts of the central nervous system are: 1--Brain and spinal cord; 2--cerebrum and cerebellum; 3--forebrain, midbrain, hindbrain, medulla; 4--brain medulla, plexes; 5--brain, plexes, spinal cord.
- \_\_\_ 18. Reflex actions are controlled by the: 1--Brain; 2--sympathetic nervous system; 3--spinal cord and medulla; 5--cerebellum and medulla.
- \_\_\_ 19. The center of balance and muscular coordination is the: 1--Hypogastric plexus; 2--cerebellum; 3--diencephalon; 4--medulla; 5--semicircular canals.
- \_\_\_ 20. The center of consciousness, memory, and reflective thinking is



the: 1--Medulla; 2--optic lobes; 3--midbrain; 4--cerebellum; 5--cerebrum.

- \_\_\_ 21. The thalamus is known as the: 1--Third eye; 2--center of sight and hearing; 3--inner brain; 4--seat of the emotions; 5--brain center controlling digestion.
- \_\_\_ 22. The total number of pairs of branch nerves from the central nervous system is: 1--31; 2--48; 3--43; 4--12; 5--3.
- \_\_\_ 23. The chief known function of the sympathetic nervous system is: 1--Control of daily work of internal organs; 2--control of dreams; 3--unconscious thought; 4--memory; 5--conditioned reflexes.
- \_\_\_ 24. The type of reflex which probably controls all insect behavior is: 1--automatic; 2--sympathetic; 3--inborn; 4--conditioned; 5--chain.
- \_\_\_ 25. An instinct is: 1--A complex reaction to a single stimulus; 2--a cat catching a mouse; 3--something that you do without thinking; 4--a group of related, inborn reflexes; 5--something that you are born with.
- \_\_\_ 26. The process of controlling and stopping one's reaction to a stimulus is called: 1--Self-control; 2--inhibition; 3--learning; 4--autosuggestion; 5--transcendentalism.
- \_\_\_ 27. Instinctive behavior is most highly developed among: 1--People; 2--plants; 3--cattle; 4--insects; 5--social insects.
- \_\_\_ 28. Man's nervous systems are the type known as: 1--Diversified; 2--ladder; 3--ring; 4--specialized; 5--diffuse.
- \_\_\_ 29. The advantages of instinctive social behavior are: 1--Division of labor and contentment; 2--no worry or unemployment; 3--food and protection; 4--no class consciousness; 5--no war.
- \_\_\_ 30. To achieve near perfection, insect social life sacrifices: 1--Education; 2--individual freedom; 3--religion; 4--the family; 5--invention.
- \_\_\_ 31. One major advantage of instinct over intelligence is: 1--Less work; 2--smarter reactions; 3--no problems; 4--nothing to learn; 5--more time.
- \_\_\_ 32. One major advantage of intelligence over instinct is: 1--Able to go to school; 2--adaptability to new situations; 3--remember what you see; 4--forget what you don't use; 5--learn to read.





- \_\_\_ 33. One danger in intelligent behavior is: 1--Slip down to level of habits; 2--learn harmful things; 3--overwork and go to pieces; 4--know too much; 5--become too arrogant.
- \_\_\_ 34. One of the fundamental ideas of science is that: 1--Intelligence is superior to instinct; 2--habits are better than reflexes; 3--for every response there is a stimulus; 4--reason is superior to emotion; 5--cells are always evolving.
- \_\_\_ 35. Our ideas of things change because: 1--We change constantly; 2--we like variety; 3--we never know them exactly as they are; 4--variety is the spice of life; 5--doing the same thing gets monotonous after a while.
- \_\_\_ 36. Man's basic needs are: 1--Too numerous to mention; 2--food, clothing, work, family, friends; 3--love, hate, fear; 4--emotional, social, and intellectual outlets; 5--food, drink, sleep, sex, variety.
- \_\_\_ 37. The theory which may explain rhythms in physical and mental activities of people and nations is the: 1--Isolation; 2--quantum; 3--Darwin's; 4--DeVries'; 5--Lamarck's.
- \_\_\_ 38. The chemical responsible for our pain sense is: 1--Auxin; 2--hormone; 3--acetic acid; 4--histamine; 5--lactic acid.
- \_\_\_ 39. The type of chemical made in the ductless glands and elsewhere in the body, which plays an important role in our behavior, is called: 1--Hormone; 2--histamine; 3--auxin; 4--acetic acid; 5--lactic acid.
- \_\_\_ 40. Of the 2 million different species of living things, and the millions of each species: 1--All react to light; 2--none can live without air; 3--no two are exactly alike; 4--none can make their own food; 5--all must eat.
- \_\_\_ 41. Everything that a living thing does is called: 1--Activity; 2--living; 3--behavior; 4--significant; 5--reaction.
- \_\_\_ 42. Anything which may produce a response is called: 1--Impulse; 2--matter; 3--energy; 4--stimulus; 5--reaction.
- \_\_\_ 43. The time required to react to a stimulus is called: 1--Delayed response; 2--reaction time; 3--reflex arc; 4--nerve pathway; 5--350 feet per second.
- \_\_\_ 44. Special structures which receive stimuli from our environment are called: 1--Perceptors; 2--activators; 3--sense organs; 4--end organs; 5--sensory neurons.



- \_\_\_ 45. The chemical sense to which all but four flavors are due is: 1--Taste; 2--smell; 3--degenerate; 4--touch; 5--sight.
- \_\_\_ 46. The basis of division of labor among ants is: 1--Age; 2--physical differences; 3--size; 4--color; 5--intelligence.
- \_\_\_ 47. Instead of waiting for physical evolution, man invented: 1--Tools; 2--genes; 3--evolution; 4--fire; 5--education.
- \_\_\_ 48. The two organs which made man's progress possible are: 1--Brain and tongue; 2--head and heart; 3--newspapers and gunpowder; 4--invention and education; 5--cerebrum and hand.
- \_\_\_ 49. The unit upon which human social life is founded is: 1--Town meeting; 2--city; 3--state; 4--family; 5--farm.
- \_\_\_ 50. Conditioned reflexes social in nature are called: 1--Mores; 2--customs; 3--taboos; 4--manners; 5--culture.
- \_\_\_ 51. Man's invention which enables him to learn from others as well as from experience is: 1--Printing; 2--language; 3--radio; 4--money; 5--schools.
- \_\_\_ 52. In order to fit into changing conditions and survive, a plant or animal must: 1--Adapt itself; 2--be able to learn; 3--forget what it knows; 4--migrate; 5--defend itself.
- \_\_\_ 53. The three strongest controls of human behavior are: 1--Past experience, present condition, present surroundings; 2--love, hate, fear; 3--heredity, training, present conditions; 4--intelligence, emotions, habits; 5--heredity, environment, will power.
- \_\_\_ 54. A state of consciousness still in the experimental stage is: 1--Day dreaming; 2--delirium; 3--sleep-walking; 4--nightmares; 5--hypnotism.
- \_\_\_ 55. Things which we cannot yet explain are often blamed to the: 1--Government; 2--supernatural; 3--war debt; 4--Garden of Eden; 5--depression.

\*Children seem to be born fearing loud noises. A two-year old child heard a loud noise when he first saw a goldfish bowl, and developed a fear of it. His father tried several remedies: A--He had an older brother show pleasure at sight of the goldfish bowl; B--He told the child repeatedly that the goldfish would not hurt him; C--He gave the child a dish of favorite food and set the goldfish bowl at the far end of the table. Each day he brought the bowl a little nearer. Which of the procedures do you suppose cured the child of his fear? Why?

56. \_\_\_\_\_

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\*From A Guide to Modern Biology, published by Harcourt, Brace and Company.



\*Classify the following statements under three headings. Put the capital letter of each type in the space to the left of each statement. A--Scientific fact; B--Conclusion from proved fact; C--Opinion.

- \_\_\_ 57. Man has a greater capacity to develop conditioned reflexes than any other animal.
- \_\_\_ 58. There is great need to improve human social behavior.
- \_\_\_ 59. Human social behavior was changed by the discovery of the germ theory of disease.
- \_\_\_ 60. Man's recent progress has been due to social rather than physical evolution.
- \_\_\_ 61. Thousands of men and women cooperate daily in a large manufacturing plant.
- \_\_\_ 62. Man only recently learned how to produce an abundance of goods.
- \_\_\_ 63. Tools have played a very important part in changing human society.
- \_\_\_ 64. Education is one of society's tools whereby each new generation is enabled to begin where the last left off, rather than at scratch, as most other animals do.
- \_\_\_ 65. Human beings can and do learn to cooperate.
- \_\_\_ 66. Most human beings are greedy and selfish and will always remain so.
- \_\_\_ 67. War cannot be eliminated from human society.
- \_\_\_ 68. You cannot change human nature.
- \_\_\_ 69. Man will always be the dominant animal on earth.
- \_\_\_ 70. On the bottom, or back, of this paper, make a clear, labeled diagram, either of the human eye, or of the human ear.

\*From Exploring Biology, published by Harcourt, Brace and Company.





## New Hampshire, High School, Behavior Unit 1941-42, Page 2

- 13 Discuss our nervous system in class.
- 14 Take quiz on nervous systems. Item 7, score sheet.
- 15 Do experiment 14: How rapidly do people react? Stand in a circle around a table, hands at sides, a few inches from each other. Teacher stands in circle with stopwatch, taps person on one side, who passes the tap to his neighbor and so on around the circle back to the teacher. The total time divided by the number of people gives the average reaction time per person.  
Item 8, score sheet.
- 16 Do experiment 15: Demonstration of the patellar reflex. Cross your legs and relax. Your partner taps your knee just below the kneecap, using the edge of his hand or a ruler. (Doctors use a rubber hammer.) With a little practice, you can find the exact place to tap. The leg jerks out if you are relaxed. Then try it on your partner.  
Item 9, score sheet.
- 17 Take notes on the teacher's lecture on "Types of Behavior."
- 18 Do experiment 16: How can a conditioned response be developed? Drop a golf ball from behind a screen high enough so a person just has time to pull his hand, lying palm down on the table, out of the way when he sees the ball. Click a clicker several times. The person of course does not move his hand. Then drop the ball so that he sees it at the same time that you click the clicker. After some practice, simply click the clicker. He will pull away his hand - a conditioned response. Check up on voluntary inhibition by dropping the ball without clicking - the ball will hit his hand.  
Item 10, score sheet.
- 19 Make a list of all inborn reflexes you use: waking up to entering school; entering school to recess; recess to leaving school; or leaving school till in bed.  
Item 11, score sheet.
- 20 Do the same for conditioned reflexes. Then state which were more numerous.  
Item 12, score sheet.
- 21 Discuss the teacher's story of "Low Bridge."
- 22 Make a list of all the habits you use during one of the above periods of time. Try to remember when you first formed each habit, and record the date. Tell your partner about any habits or mannerisms he is not ~~is~~ aware of and let him do the same for you. Add these to your list.  
Item 13, score sheet.
- 23 Discuss types of behavior in class.
- 24 Select a habit you want to form, and explain in detail the best way of forming this habit.  
Item 14, score sheet.
- 25 Take quiz on types of behavior.  
Item 15, score sheet.

1. The first part of the report is a general introduction to the subject of the study. It discusses the importance of the problem and the objectives of the research. It also mentions the scope of the study and the methods used.

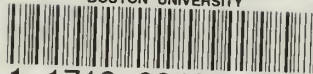
2. The second part of the report is a detailed description of the experimental work. It includes a description of the apparatus used, the procedure followed, and the results obtained. It also discusses the errors and the limitations of the experiment.

3. The third part of the report is a discussion of the results. It compares the results with the theoretical predictions and with the results of other experiments. It also discusses the implications of the results and the conclusions drawn from them.

4. The fourth part of the report is a conclusion. It summarizes the main findings of the study and states the conclusions drawn from them. It also mentions the suggestions for further work.

5. The fifth part of the report is a list of references. It includes the names of the authors and the titles of the books and articles referred to in the report.

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